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STRONGYLOIDIASIS IN MAN: INFESTATION WITH STRONGYLOIDES STERCORALIS (BAVAY, 1876).

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INFESTATION with the round worm *Strongyloides stercoralis* occurs in hot, moist climates and has been reported in New Caledonia, the New Hebrides, New Guinea, the East Indies generally and the coastal belt of Queensland. Of the few surveys undertaken on the Australian mainland, that of Heydon and Green[1] (1931), in which they found an incidence of 0·03% among white people on the Atherton Tableland, is the most authoritative. These authors believe that earlier surveys were inaccurate, owing to contamination of the fæcal specimens with coprophile nematodes at the time of collection. In Australia, outside the tropical zone, this infestation has occasionally been reported in the inmates of asylums,[2] in miners (Bendigo and Broken Hill),[3] and in southern Europeans living in Australia.[3] As Australian troops have served in these endemic areas, it is likely that a considerable number of men have been infested, and that the condition will be of clinical importance both now and in the future.

The observations recorded in this paper are based on a study of sixteen cases of strongyloides infestation that have been recognized amongst the patients admitted to a military hospital during the past nine months. Fourteen of these men had served in New Guinea (some of them also in the Middle East), but two had never left the Australian mainland. Of these latter, one had lived for many years in the Townsville district and the other had served in the Darwin zone, where he contracted chronic diarrhœa.

The Parasite.

Strongyloides stercoralis is a round worm of the class Nematoda, superfamily Rhabditoidea. The larvæ of this worm were first recognized by Normand[4] in 1876 in the stools of French colonial troops invalided home from Cochin China suffering from intractable diarrhœa. Bavay (1876)[5] described the larvæ in the fæces as *Anguillula stercoralis*, and those in the bile ducts and bowel wall as *Anguillula intestinalis*. Later workers[6] have shown these forms to be merely different phases in the life cycle of *Strongyloides stercoralis*. They have also demonstrated the existence of two life cycles, one a direct cycle resembling that of hookworm, and the other an indirect cycle resembling that of the free-living nematodes. It was formerly considered that these cycles indicated two strains of the parasite, the direct strain occurring in temperate zones and the indirect strain in the tropics; but recently Beach (1936)[7] has shown that the type of cycle is determined by the surroundings of the larvæ.

The Direct Cycle.

The parasitic female in the upper part of the intestine lays dozens of eggs each day. These ova, resembling hookworm ova but smaller, are laid partially embryonated, and they usually hatch before or shortly after entering the bowel lumen. They are 50μ to 58μ in length by 30μ to 34μ in breadth, and have a thin, smooth shell of the hookworm type. These eggs are seen only in the fæces of patients with severe diarrhœa or after purgation. They are then usually joined to one another by the remnants of the maternal uterus.

These ova hatch into rhabditoid larvæ. When seen in fæcal specimens, these larvæ are usually 200μ to 250μ in length. They have a short buccal cavity leading into the characteristic rhabditoid œsophagus, which is constricted and surrounded by a nerve ring at the junction of the middle and posterior thirds and then expands into a pyriform bulbus. The bulbus opens into a simple intestine which ends subterminally. The primordial gonad forms a prominent group of cells just caudad to the middle of the body. The rhabditoid larvæ become filariform by becoming lengthened and narrowed. This development usually occurs after evacuation from the host, but it may occur in the alimentary canal.

This form (700μ in length) has a simple, straight œsophagus and intestine. Its tail, unlike the corresponding infective filariform larva of hookworm and trichostrongylus, is notched. The filariform larvæ of strongyloides probably survive for only a few days after evacuation. These larvæ may penetrate the skin or mucosa of a host, gaining entry into a vein and passing to the lungs, and after breaking through the alveolar walls into the air passages, the larvæ develop into adults. The females, after fertilization, are coughed up and swallowed, and some become established in the folds and crypts of the duodenum and jejunum, and later burrow into the submucosa. The fate of the males is uncertain.

The parasitic females are small, slender worms 2·2 millimetres in length and 30μ to 75μ in breadth, with a pointed tail. They have a long œsophagus, extending one-third the length of the body, a simple intestine ending subterminally, and a nervous system represented by a small nerve ring around the œsophagus. The most prominent structures are the paired uterus, oviducts and ovaries, extending anteriad and caudad from the short vulva, which opens just caudad to the middle of the body. The uterus is filled with immature and partially embryonated ova.

The parasitic male (length about 0·7 millimetre and breadth 40μ to 50μ) is broader and shorter than the female. It has a rhabditoid œsophagus and prominent testes. Two copulatory spicules and a gubernaculum are present on the ventral surface in the concavity of the ventrally curved tail.

The direct cycle resembles that seen in hookworm infestations, but as the rhabditoid larvæ may become filariform within the intestine, reinfection of the host may occur through the alimentary mucosa or perianal skin, without the necessity for an external phase in the cycle. This phenomenon has been referred to as autoinfection (Fülleborn, 1926).[9]

The Indirect Cycle.

Unlike hookworm, strongyloides may, under favourable conditions, carry out a free-living cycle. In this cycle the rhabditoid larvæ develop directly into free-living adults which resemble the parasitic forms, except that the female is shorter and broader (measuring one millimetre by 50μ to 75μ). The free-living female lays ova (70μ in size) which develop into rhabditoid larvæ, and these in turn develop into free-living adults. In certain circumstances the free-living rhabditoid larvæ may develop into filariform larvæ and the worm become potentially parasitic again. Conditions favouring the free-living form are rare outside tropical areas.

Pathology.

In strongyloidiasis pathological changes occur chiefly in the skin, lungs, alimentary canal and blood; but larvæ have been recorded in inflammatory exudates and sputum. In fatal cases worms or larvæ have been found in most tissues of the host.

The Skin.

The changes seen in the skin may be due either to the passage of larvæ or to a general allergic reaction. The passage of filariform larvæ produces in some cases a local erythema with petechial hæmorrhages. This phenomenon will be seen in exposed skin or in the perianal region (autoinfection), and resembles the "ground itch" of hookworm disease. Generalized urticaria has also been recorded in this infestation and is probably an allergic manifestation.

The Lungs.

In the lungs damage to alveolar walls produces localized inflammatory lesions. Should adult worms be trapped in the lungs more extensive reactions occur, leading to lobular collapse or consolidation. Larvæ, developing from eggs laid by these trapped worms, may migrate and penetrate the pleura or pericardium, producing effusion into these spaces.

The Intestine.

Adult worms entering the small intestine may remain in the mucosal folds and crypts or penetrate into the submucosal tissues, where they move in tortuous tissue channels. With heavy infestations, the submucosa may become honeycombed and patches of mucosa destroyed. As in the lungs, larvæ may develop in the submucosa and penetrate surrounding tissues, giving rise to peritonitis and rarely to ileus. Penetration of the colonic mucosa by larvæ is apparently the cause of the intractable diarrhœa seen in some cases.

The Blood.

The characteristic change in the blood picture in early infestation is pronounced eosinophilia[9] without appreciable disturbance of the other leucocytes. In later stages of the infestation eosinopenia is said to occur.

Although strongyloides infestations in man have often been thought of little clinical significance, several fatal cases[10][11] have been recently recorded. In these cases death has followed prolonged chronic diarrhœa, inanition and the accidents of massive infestation.

The Clinical Picture (Table II).

Thirteen of the patients in this series had associated tropical disease (Table I), and as these complicating conditions were readily treated, it has been possible to evaluate the symptomatology of strongyloides infestations. These patients had been in tropical areas for only a few months, and it is thought therefore that the clinical picture observed is that of early infestation.

TABLE I.
Associated Diseases.

Disease.	Number of Cases.
Malaria	14
Hookworm infestation	8
Scrub typhus	2
Ascaris lumbricoides infestation	1
Entamœba histolytica cysts (carrier)	1
Peripheral neuritis	1
Catarrhal jaundice	2
No associated disease	2

The signs and symptoms of strongyloidiasis are largely due to the presence of worms or larvæ in the various tissues of the host. Only in the blood is any disturbance seen which may be due to a diffusible factor generated by the parasite.[9]

The passage of larvæ through the skin of the host is said to give rise to an "itch"; but in the present series only four patients recalled any skin lesion, other than tinea, within the past year. In three of these cases early hookworm infestation was the probable cause of their skin lesions. The remaining patient had an attack of urticaria five months before larvæ were demonstrated in his fæces.

In long-standing infestations lung symptoms have been frequently recorded, and asthmatic attacks have been severe in natives studied by de Langen and Lichtenstein.[12] Although the patients in this series were probably in the early stages of infestation, lung signs or symptoms have been noted in seven cases. Four of these patients com-

plained of an unproductive cough lasting for some weeks, two or three months before their admission to hospital. One had been investigated for suspected pulmonary tuberculosis, and one had a small hæmoptysis whilst under observation in hospital. Radiographic examination of four patients revealed increased broncho-vascular markings. Only one of these patients complained of cough, and on no occasion have larvæ been found in their sputum. The frequent occurrence of such signs and symptoms is in pronounced contrast to their complete absence from a series of hookworm patients studied at the same time.[13]

Involvement of the alimentary canal may produce dyspepsia and diarrhœa. Five patients complained of dyspepsia, variously described as a recurring loss of appetite, a gnawing sensation in the stomach or a general vague abdominal discomfort. It was thought that these symptoms might be due to associated helminthic infestation; but in two cases they were not relieved by removal of other helminths, and in one there was no associated helminthic infestation. In four of the cases symptomatic relief followed the exhibition of gentian violet. Within recent months eleven patients had suffered attacks of dysentery or diarrhœa. Eight of them had dysentery in New Guinea, with the passage of blood and mucus in the stools, and this was probably due to bacillary infection; two, who had not been out of Australia, had chronic mild dysentery of many months' duration associated with the passage of mucus and occasionally blood, and in these instances larvæ were found in the mucus; the remaining patient has had several mild attacks of diarrhœa whilst under observation.

In a previous paper,[9] the blood picture was discussed in detail. No anæmia was present, and the only leucocyte disturbance was pronounced eosinophilia. The average maximum number of leucocytes in this series was 16,000 cells per cubic millimetre, with a range from 8,000 to 30,000, and the average maximum number of eosinophile cells was 4,300 per cubic millimetre, with a range from 1,100 to 12,600. However, in the eight cases uncomplicated by other helminth infection, the average number of eosinophile cells was 2,570 per cubic millimetre, with a range from 1,100 to 5,300. In one case a persistently elevated number of eosinophile cells of approximately 800 cells per cubic millimetre increased to 5,300 cells per cubic millimetre ten days later, and in another eight days strongyloides larvæ were found in the fæces.

Only two patients did not complain of one or more of these symptoms, which persisted after associated diseases had been satisfactorily treated. The general impression, gained from the men, was that they were in poor health, but that pronounced symptomatic relief followed treatment, even though the infestation was not eradicated.

The signs and symptoms present in this early stage of infestation may be summarized as chronic cough, dyspepsia, chronic diarrhœa and eosinophilia.

Diagnosis.

When a patient has seen military service in New Guinea (or other endemic areas), infestation with *Strongyloides stercoralis* should be borne in mind as a possible cause of obscure pulmonary symptoms, chronic dyspepsia, chronic diarrhœa, or symptomless eosinophilia. As most helminthic infestations produce eosinophilia, the demonstration of the presence of one does not exclude the presence of another, and if, for example, symptoms persist after adequate treatment of declared hookworm infestation, a search should in all cases be made for strongyloides larvæ.

The diagnosis of strongyloides infestations depends on the detection of either form of its larvæ or adult worms. These may be looked for in fresh, carefully collected fæcal specimens, by low magnification examination of saline smears prepared directly from the specimen. If the number of larvæ is small, it may be necessary to concentrate them by centrifuging a watery suspension of the specimen before preparing the smear. Cultural examination of the fresh specimen may enable a diagnosis to be made when only a few larvæ are being evacuated by the host (Appendix A), since this enables the larvæ to develop and multiply in a free-living cycle.

Points of confusion in examinations of the cultures arise between the larvæ of strongyloides, of hookworm and of trichostrongylus, which may all appear in either old or cultured fæcal specimens. The rhabditoid larvæ of strongyloides differ from the rhabditoid hookworm larvæ and from the pseudo-rhabditoid trichostrongylus larvæ in having a short buccal cavity and a prominent primordial gonad. The filariform larvæ of strongyloides have a notched tail, those of hookworm a pointed tail, and those of trichostrongylus a tuberculated tail. In fæcal cultures strongyloides adults alone will appear, as the other nematodes mentioned do not develop in a free-living cycle.

Criteria of Cure.

As the treatment of this infestation is at present unsatisfactory, it was felt that strict criteria of cure should be used in the study of these patients. As a result of a study of other helminthic infestations, the following requirements were laid down: (i) The patient must be symptom-free. (ii) The number of eosinophile cells must have returned to normal limits. (iii) The fæces, on cultural examination, must be free from larvæ on three successive examinations at intervals of one week. As these patients may sometimes have larvæ in fæcal specimens only intermittently (Table II), it is also thought that they should all be reobserved six months after an apparent cure.

Treatment.

Gentian violet has been described as a specific drug for strongyloides infestations; but the results of treatment in this series have been disappointing. In thirteen cases gentian violet was given by mouth, in enteric-coated capsules, in doses of one grain three times a day, for eight days, the dosage being repeated for a further eight days after an interval of seven days. During the time of administration of this drug, the patient was kept on a light diet and at rest. In four cases 25 cubic centimetres of a 0·1% solution of gentian violet in water were administered through a stomach tube into the fasting stomach; this treatment was repeated on alternate days.

As the parasites are found in the tissues of the host, it was thought that a drug given parenterally might be more effective than one which is poorly absorbed like gentian violet given orally. Emetine hydrochloride, "Fouadin" and tartar emetic have therefore been used in some cases in the following doses: emetine hydrochloride, one grain given intramuscularly once a day for ten doses; "Fouadin", given intramuscularly, at first by injections of 1·5 cubic centimetres, then 3·5 cubic centimetres, then 5·0 cubic centimetres on alternate days, until a total of 40 cubic centimetres has been given; tartar emetic solution for intravenous injection, made up in distilled water in a strength of one grain per cubic centimetre, the initial dose being 0·5 grain, and subsequent doses being gradually increased up to 1·5 grains given on alternate days. The details of the drugs given in each case are shown in Table II.

Although in the majority of cases symptomatic relief of the intestinal symptoms was obtained by the exhibition of gentian violet, in only one case did the number of eosinophile cells return to normal and the fæces remain free from larvæ on three successive examinations at intervals of one week. In one instance, although the fæces had been free from larvæ for three successive weeks, the number of eosinophile cells was 7,040 per cubic millimetre.

"Fouadin" therapy was given to five patients, but no cures are recorded. Emetine hydrochloride likewise failed to effect a cure in five cases. Tartar emetic was administered intravenously to five patients, but in none of these cases have the criteria of cure been achieved.

Mild toxic symptoms have been commonly observed in some cases to follow the administration of tartar emetic. They consist of a paroxysmal cough within a few minutes of administration and muscle and joint pains some eight hours later. No toxic symptoms have been observed with any of the other drugs used.

Two patients were readmitted to this hospital (with malarial relapses) three months after having been dis-

TABLE II.

Case Number.	Clinical Picture Before Treatment.							Associated Helminths.	Associated Diseases.	Treatment.
	Skin.	Lungs.	Intestines.	Blood. Leucocytes per Cubic Millimetre.	Blood. Eosinophile Cells per Cubic Millimetre.	Blood. Hæmoglobin Value.[1]	Fæces.[1]			
I	Urticaria, September, 1942, for one week.	Useless cough, December, 1942. Investigated for pulmonary tuberculosis. X-ray examination, April 1, 1943; no abnormality detected.	Diarrhœa with passage of blood and mucus. September, 1942, ? bacillary dysentery.	15,000 (19/3/43) 12,600 (30/3/43) 10,700 (8/4/43) 12,200 (22/4/43) 9,200 (30/4/43) 10,200 (19/6/43)	4,500 (19/3/43) 1,390 (30/3/43) 320 (8/4/43) 1,220 (22/4/43) 920 (30/4/43) 720 (19/6/43)	75% (18/12/42) 80% (7/2/42) 90% (18/3/43) 93% (19/6/43)	Larvæ found, 22/2/43 Larvæ found, 12/4/43. Larvæ found, 24/5/43. Larvæ found, 19/6/43	Hookworm.	Benign tertian malaria; scrub typhus.	Gentian violet course, 1/2/43. Gentian violet course, 18/4/43. "Fouadin" course, 7/5/43.
II	—	X-ray examination, no abnormality detected.	Diarrhœa in New Guinea. Vague, flatulent dyspepsia with great symptomatic improvement after gentian violet given by tube.	12,250 (6/3/43) 16,700 (13/3/43) 8,100 (26/3/43) 13,000 (15/4/43) 16,760 (30/4/43)	4,100 (6/3/43) 8,520 (13/3/43) 2,100 (26/3/43) 3,250 (15/4/43) 8,520 (30/4/43)	85% (22/2/43) 83% (3/3/43) 85% (18/3/43) 80% (22/4/43) 75% (22/5/43)	Larvæ found, 4/3/43. Larvæ found, 5/4/43. Larvæ found, 27/5/43	Hookworm. *Ascaris lumbricoides.*	Benign tertian malaria.	Gentian violet course. Gentian violet by tube, three doses.
III[2]	—	Cough for one month, October, 1942. X-ray examination, no abnormality detected. Bronchovascular markings exaggerated, May, 26, 1943.	Diarrhœa with passage of blood and mucus, one month, December, 1942.	12,200 (26/3/43) 12,600 (8/4/43) 14,900 (26/4/43)	4,400 (26/3/43) 4,670 (8/4/43) 4,320 (26/4/43)	85% (1/2/43) 83% (21/3/43) 93% (12/4/43)	Larvæ found, 25/2/43 Larvæ found, 14/4/43. Larvæ found, 24/5/43.	Hookworm. *Trichocephalus trichiurus.*	Benign tertian malaria.	Gentian violet course, 20/3/43. Gentian violet by tube, two doses.
IV	—	Cough in January. X-ray examination, no abnormality detected, 26/3/43. Pain in left side of chest. Blood-stained sputum. X-ray examination, no abnormality detected, 14/5/43. No larvæ in sputum.	Diarrhœa with passage of blood and mucus. Larvæ found in mucus, 1/2/43.	10,700 (25/3/43) 12,700 (16/4/43) 9,000 (25/4/43) 10,300 (19/6/43)	1,070 (25/3/43) 1,650 (16/4/43) 990 (25/4/43) 1,200 (19/6/43)	88% (31/3/43) 85% (7/4/43) 90% (21/4/43) 90% (19/6/43)	No larvæ found, 24/3/43. Larvæ found, 22/4/43 Larvæ found, 24/5/43. Larvæ found, 19/6/43.	—	—	Gentian violet course, February, 1943. Gentian violet course, 17/3/43. Emetine, one grain, 6/5/43, two doses. "Fouadin" course, 31/5/43.
V[3]	—	X-ray examination, no abnormality detected, 1/4/43.	—	11,800 (19/3/43) 9,500 (2/4/43) 10,500 (26/4/43) 8,500 (8/10/43)	5,500 (19/3/43) 1,900 (2/4/43) 2,200 (26/4/43) 2,150 (8/10/43)	85% (1/3/43) 90% (17/3/43) 85% (2/4/43) 90% (16/4/43)	Larvæ found, 29/4/43. No larvæ found, 19/5/43. No larvæ found, 26/5/43. Larvæ found, 31/5/43. No larvæ found, 29/9/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 22/3/43. Emetine, one grain, 29/4/43, ten doses. "Fouadin" course.
VI	? Ground itch.	X-ray examination, no abnormality detected, 9/4/43.	Diarrhœa with passage of mucus on admission to hospital. Symptomatic relief with gentian violet given by tube. Flatulent dyspepsia.	9,900 (3/3/43) 12,700 (16/4/43) 19,700 (30/4/43)	1,190 (3/3/43) 635 (16/4/43) 1,380 (30/4/43)	83% (21/4/43) 93% (30/4/43)	Larvæ found, 2/4/43. No larvæ found, 17/5/43. Larvæ found, 27/5/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 8/4/43. Gentian violet by tube, three doses.

[1] Hæmoglobin value: 100% = 14·5 grammes per 100 cubic centimetres of blood; larvæ: larvæ of *Strongyloides stercoralis*.
[2] Patient two stone underweight; general condition poor.
[3] Readmission September, 1943, benign tertian malaria relapse; recurring anorexia and vague abdominal pains for several weeks.
[4] Readmission September, 1943, benign tertian malaria relapse. Alternating constipation and mild diarrhœa still present. Vague abdominal pains. Occasional cough. Recurring anorexia.
[5] Records incomplete.

TABLE II.—*Continued.*

Case Number.	Clinical Picture Before Treatment.							Associated Helminths.	Associated Diseases.	Treatment.
	Skin.	Lungs.	Intestines.	Blood. Leucocytes per Cubic Millimetre.	Blood. Eosinophile Cells per Cubic Millimetre.	Blood. Hæmoglobin Value.[1]	Fæces.[1]			
VII	—	X-ray examination, no abnormality detected, 1/4/43.	Diarrhœa with passage of blood and mucus, one month, December, 1942.	12,000 (1/4/43) 12,000 (19/4/43) 12,000 (3/5/43) 12,000 (17/5/43) 12,000 (31/5/43)	1,200 (1/4/43) 1,200 (19/4/43) 1,200 (3/5/43) 1,200 (17/5/43) 1,200 (31/5/43)	85% (1/4/43) 85% (19/4/43) 85% (3/5/43) 85% (17/5/43) 85% (31/5/43)	Larvæ found, 1/4/43. Larvæ found, 19/4/43. Larvæ found, 3/5/43. Larvæ found, 17/5/43. Larvæ found, 31/5/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 1/4/43. Gentian violet course, 19/4/43. Gentian violet course, 3/5/43. Gentian violet course, 17/5/43. Gentian violet course, 31/5/43.
VIII	—	X-ray examination, no abnormality detected, 1/4/43.	Diarrhœa with passage of blood and mucus, one month, December, 1942.	12,000 (1/4/43) 12,000 (19/4/43) 12,000 (3/5/43) 12,000 (17/5/43) 12,000 (31/5/43)	1,200 (1/4/43) 1,200 (19/4/43) 1,200 (3/5/43) 1,200 (17/5/43) 1,200 (31/5/43)	85% (1/4/43) 85% (19/4/43) 85% (3/5/43) 85% (17/5/43) 85% (31/5/43)	Larvæ found, 1/4/43. Larvæ found, 19/4/43. Larvæ found, 3/5/43. Larvæ found, 17/5/43. Larvæ found, 31/5/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 1/4/43. Gentian violet course, 19/4/43. Gentian violet course, 3/5/43. Gentian violet course, 17/5/43. Gentian violet course, 31/5/43.
IX	—	X-ray examination, no abnormality detected, 1/4/43.	Diarrhœa with passage of blood and mucus, one month, December, 1942.	12,000 (1/4/43) 12,000 (19/4/43) 12,000 (3/5/43) 12,000 (17/5/43) 12,000 (31/5/43)	1,200 (1/4/43) 1,200 (19/4/43) 1,200 (3/5/43) 1,200 (17/5/43) 1,200 (31/5/43)	85% (1/4/43) 85% (19/4/43) 85% (3/5/43) 85% (17/5/43) 85% (31/5/43)	Larvæ found, 1/4/43. Larvæ found, 19/4/43. Larvæ found, 3/5/43. Larvæ found, 17/5/43. Larvæ found, 31/5/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 1/4/43. Gentian violet course, 19/4/43. Gentian violet course, 3/5/43. Gentian violet course, 17/5/43. Gentian violet course, 31/5/43.
X	—	X-ray examination, no abnormality detected, 1/4/43.	Diarrhœa with passage of blood and mucus, one month, December, 1942.	12,000 (1/4/43) 12,000 (19/4/43) 12,000 (3/5/43) 12,000 (17/5/43) 12,000 (31/5/43)	1,200 (1/4/43) 1,200 (19/4/43) 1,200 (3/5/43) 1,200 (17/5/43) 1,200 (31/5/43)	85% (1/4/43) 85% (19/4/43) 85% (3/5/43) 85% (17/5/43) 85% (31/5/43)	Larvæ found, 1/4/43. Larvæ found, 19/4/43. Larvæ found, 3/5/43. Larvæ found, 17/5/43. Larvæ found, 31/5/43.	Hookworm.	Benign tertian malaria.	Gentian violet course, 1/4/43. Gentian violet course, 19/4/43. Gentian violet course, 3/5/43. Gentian violet course, 17/5/43. Gentian violet course, 31/5/43.

[4] Records incomplete.

TABLE II.—*Continued.*

VII	—	X-ray examination, 26/3/43. Broncho-vascular markings exaggerated.	Diarrhœa for seven months. Gradual onset.	8,100 (25/3/43) 10,200 (8/4/43) 9,800 (30/4/43) 10,000 (19/6/43)	490 (25/3/43) 820 (8/4/43) 1,080 (30/4/43) 700 (19/6/43)	90% (22/2/43) 85% (18/3/43) 90% (19/6/43)	Larvæ found, 22/2/43. Larvæ found, 26/3/43. Larvæ found, 12/4/43. Larvæ found, 24/5/43. Larvæ found, 19/6/43.	—	—	Gentian violet course, 26/2/43. Emetine, one grain, 30/4/43, ten doses. "Fouadin" course, 31/5/43.
VIII[4]	Ground itch—lasted six weeks.	Cough for one month.	Diarrhœa in New Guinea.	12,600 (10/4/43) 12,000 (10/6/43) 8,300 (13/9/43)	3,650 (10/4/43) 360 (10/6/43) 1,490 (13/9/43)	90% (10/6/43)	Larvæ found, 10/4/43. Larvæ found, 19/5/43. No larvæ found, 25/8/43. Larvæ found, 13/9/43.	Hookworm.	Benign tertian malaria; peripheral neuritis.	Gentian violet course, 12/4/43. Emetine, one grain, 5/5/43. Gentian violet course, 4/10/43. Tartar emetic, total 13 grains, 4/10/43.
IX	—	X-ray examination of lungs, no abnormality detected, March, 1943.	Diarrhœa in New Guinea.	11,400 (8/3/43) 14,200 (26/3/43) 13,900 (2/4/43) 12,600 (30/4/43) 14,100 (3/6/43) 16,000 (19/6/43)	1,026 (8/3/43) 1,850 (26/3/43) 2,220 (2/4/43) 1,385 (30/4/43) — 1,800 (19/6/43)	85% (8/3/43) 95% (26/3/43) 90% (30/4/43) 93% (3/6/43) 90% (19/6/43)	No larvæ found, 22/3/43. Larvæ found, 28/5/43. No larvæ found, 19/6/43.	—	Benign tertian malaria.	Emetine, one grain, 19/5/43, ten doses. "Fouadin" course, 31/5/43.
X	—	—	Three months' history of vague dyspepsia. Marked symptomatic relief following gentian violet. This has not been relieved by anthelminthic mixture. (*Oleum Chenopodii* and carbon tetrachloride).	14,700 (17/4/43) 14,900 (27/4/43) 10,350 (1/6/43)	1,760 (17/4/43) 2,090 (27/4/43) 410 (1/6/43)	78% (17/4/43) 80% (27/4/43)	Larvæ found, 1/5/43. No larvæ found, 4/6/43. No larvæ found, 11/6/43. No larvæ found, 18/6/43.	—	Benign tertian malaria.	Gentian violet course.
XI[5]	—	—	—	12,000 (26/5/43)	120 (26/5/43)	—	Larvæ found, 24/5/43. Larvæ found, 22/6/43.	Hookworm.	Benign tertian malaria catarrhal jaundice.	Gentian violet course.
XII	—	—	—	30,000 (9/6/43) 24,500 (13/7/43) 16,000 (20/7/43)	12,600 (9/6/43) 6,370 (13/7/43) 7,040 (20/7/43)	90% (9/6/43)	Larvæ found, 14/6/43. No larvæ found, 28/6/43. No larvæ found, 2/7/43. No larvæ found, 26/7/43.	Hookworm.	Scrub typhus; benign tertian malaria.	Gentian violet given by tube, three doses.
XIII	—	Recurrent colds, cough with sputum containing flecks of blood occasionally. (Commenced before patient went to New Guinea.)	Vague dyspepsia (bloated feeling) since return to Australia. Occasional attacks of transient diarrhœa. No mucus.	13,700 (4/6/43) 9,800 (11/6/43) 14,700 (21/6/43) 14,300 (28/6/43) 16,000 (7/7/43) 12,000 (2/8/43)	820 (4/6/43) 200 (11/6/43) 5,290 (21/6/43) 3,866 (28/6/43) 4,480 (7/7/43) 4,800 (2/8/43)	—	No larvæ found, 5/6/43. Larvæ found, 30/6/43. No larvæ found, 7/8/43. Larvæ found, 28/8/43	—	Benign tertian malaria (relapse, 7/8/43).	Gentian violet capsules, seven doses. Tartaric emetic, 9/7/43, total 11 grains.
XIV	—	X-ray examination of lungs, no abnormality detected.	Dysentery, passage of blood and mucus, for seven days in New Guinea; ? bacillary dysentery. Since then bowel actions three times a day. Recurring anorexia, nocturnal epigastric pain. Complete relief with gentian violet.	15,900 (5/8/43) 14,200 (6/9/43)	3,970 (5/8/43) 1,970 (6/9/43)	90% (5/8/43)	Larvæ found, 21/7/43. No larvæ found, 23/8/43. No larvæ found, 30/8/43. No larvæ found, 14/9/43.	—	Benign tertian malaria. *Entamœba histolytica* cysts carrier.	Gentian violet course. Tartar emetic, total 11 grains.

[1] Hæmoglobin value: 100% = 14·5 grammes per 100 cubic centimetres of blood; larvæ: larvæ of *Strongyloides stercoralis*.
[2] Patient two stone underweight; general condition poor.
[3] Readmission September, 1943, benign tertian malaria relapse; recurring anorexia and vague abdominal pains for several weeks.
[4] Readmission September, 1943, benign tertian malaria relapse. Alternating constipation and mild diarrhœa still present. Vague abdominal pains. Occasional cough. Recurring anorexia.
[5] Records incomplete.

TABLE II.—*Continued.*

Case Number.	Clinical Picture Before Treatment.				Blood.			Associated Helminths.	Associated Diseases.	Treatment.
	Skin.	Lungs.	Intestines.	Leucocytes per Cubic Millimetre.	Eosinophile Cells per Cubic Millimetre.	Hæmoglobin Value.[1]	Fæces.[2]			
XV	General scrub itch.	First cold for four years; onset corresponds with the finding of larvæ in fæces. X-ray examination, increased vascular shadows, 6/8/43.	Diarrhœa with passage of blood and mucus in March. Loose bowel actions in attacks ever since. No definite history of dyspepsia, except one commencing before New Guinea and stopping day he left.	10,300 (11/7/43) 11,300 (20/7/43) 19,500 (28/7/43) 12,000 (31/8/43)	2,000 (11/7/43) 2,825 (20/7/43) 2,530 (28/7/43) 1,900 (31/8/43)	93% (3/8/43)	No larvæ found, 2/8/43. Larvæ found, 5/8/43. Larvæ found, 31/8/43.	—	Benign tertian malaria.	Tartar emetic, 11/8/43, total 10 grains.
XVI	—	"Cigarette" cough for years. X-ray examination of lungs, increased basal broncho-vascular markings.	No dyspepsia. Had one attack of diarrhœa in New Guinea, lasting four days; no blood passed.	9,000 (4/9/43) 14,500 (15/9/43)	180 (4/9/43) 1,454 (15/9/43)	98% (25/8/43)	Larvæ found, 22/8/43. Larvæ found, 18/9/43.	—	—	Gentian violet course. Tartar emetic, total 13 grains.

[1] Hæmoglobin value: 100% = 14·5 grammes per 100 cubic centimetres of blood; larvæ: larvæ of *Strongyloides stercoralis*.
[2] Patient two stone underweight; general condition poor.
[3] Readmission September, 1943, benign tertian malaria relapse; recurring anorexia and vague abdominal pains for several weeks.
[4] Readmission September, 1943, benign tertian malaria relapse. Alternating constipation and mild diarrhœa still present. Vague abdominal pains. Occasional cough. Recurring anorexia.
[5] Records incomplete.

charged, symptom-free. They both complained of abdominal discomfort for some weeks prior to their readmission. In one case this was a recurrence of previous symptoms, and in the other it was the first occasion on which the patient had had dyspeptic symptoms. In one case larvæ were present in the fæces, in the other they were not found at a single examination; however, the patient's eosinophile cells still numbered 2,150 cells per cubic millimetre.

None of these drugs can be considered to be a satisfactory agent for eradicating the infestation, although symptomatic relief can readily be achieved by the exhibition of gentian violet. This relief does not appear to be permanent, and recurrences of symptoms are to be expected.

Discussion.

In this series of patients it is apparent that the infestation has produced symptoms in the lungs, the alimentary system and the blood. The recurrent nature of these symptoms is such that they are likely to lead to extensive investigation unless strongyloidiasis is thought of as a possible cause. Although treatment with gentian violet leads to symptomatic relief, the failure to eradicate the infestation means subsequent recurrences of the disability.

The problems of hygiene in strongyloidiasis are similar to those of hookworm disease, and primarily consist of the disposal of excreta so that filariform larvæ can have no access to a fresh host, and the free-living cycle is prevented. Personal hygiene is much more important than in hookworm disease, for filariform larvæ may be evacuated by the host, and if they come in contact with the skin, as in the perianal region or hands, they will cause autoinfection. Strongyloides-infested patients, unlike those with hookworm infestation, do not lose their infectivity as time progresses, for the infestation is self-maintaining.

Summary.

1. A series of sixteen cases of human infestation with *Strongyloides stercoralis* is recorded.

2. The symptomatology, diagnosis and treatment of this infestation are discussed.

Acknowledgement.

We wish to thank the Director-General of Medical Services for permission to publish this paper.

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Appendix A.

Wet Fæcal Smears.

A wet smear is prepared by mixing on a glass slide a small amount of fæces with normal saline solution in the ratio of approximately one part of fæces to fourteen parts of

[1] The general account of the parasite is based on C. F. Craig and E. C. Faust's "Clinical Parasitology".

saline solution. The film is then covered by a coverslip seven-eighths of an inch in diameter. The whole area of six preparations must be systematically examined with low magnification. If mucus is seen in the specimen, both that part and an apparently normal portion should be examined.

Culture and Isolation of Helminth Larvæ.

About one ounce of the fæces to be examined is mixed with an equal quantity of moist garden soil, previously sterilized by being boiled. This mixture is then placed in a small jar, such as a two-ounce "Vegemite" pot, and kept in a warm dark spot for seven days, to allow larvæ to grow and eggs to hatch. At the end of this time the mouth of the jar is covered with a piece of linen or multiple layers of gauze, held in place by a rubber band. A six-inch filter funnel with a short rubber tube and clip attached is filled with water at 55° C. and held vertically in a clamp. Into this filled funnel the covered jar is inverted, so that the linen cover just touches the water. If present, larvæ may often be seen with the naked eye migrating to the warm fluid in the funnel. After one hour, five cubic centimetres of fluid are drawn off through the rubber tube on the funnel and centrifuged. The deposit is examined microscopically for larvæ or adult worms.

THE THERAPEUTIC VALUE OF SULPHAGUANIDINE IN THE TREATMENT OF BACILLARY DYSENTERY AT AN AUSTRALIAN GENERAL HOSPITAL.

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DURING the period from July to December, 1942, there was an outbreak of bacillary dysentery in the area, among troops who were mainly recruits aged between eighteen and twenty-five years. Thirty-one patients in the series were treated with sodium sulphate and twenty-six with sulphaguanidine. In all, some two hundred patients were admitted to the dysentery ward during this period, but owing to various complicating features they were not suitable for inclusion in the controlled series. However, general observation of these patients supported the conclusions reached in this series.

Although the number of patients treated was not large and the severity of the illness was not great in either the test cases or the controls, the results of the survey indicated that sulphaguanidine is a non-toxic drug which lessens the severity of Flexner dysentery, hastens the healing of the bowel and enables a soldier to return to his unit more rapidly and with less chance of a relapse.

These findings support the observations of R. F. West,[1] except that the average number of days before sigmoidoscopic findings were finally normal was longer in our series. His valuable findings led him to draw the following conclusions:

> In view of the fact that the older methods of treatment (of bacillary dysentery) are so unsatisfactory and unreliable and that sulphaguanidine therapy is so uniformly good, sulphaguanidine should be used in all cases whether mild or severe.

The weather was hot, the daily maximum temperature ranging from 80° F. to 110° F. Camp hygiene facilities in the area were inadequate and laboratory investigations proved that the numerous patients with diarrhœa who were being admitted to hospital, especially from a pioneer unit, were suffering from true bacillary dysentery.

A dysentery ward and annexe were established as soon as adequate hospital equipment and personnel had arrived at the hospital site. Only limited supplies of sulphaguanidine were available, so it was decided to test its therapeutic value in the treatment of this disease.

Sulphaguanidine is the guanidine derivative of sulphanilamide. It is administered orally and probably exerts its bacteriostatic or bactericidal effect locally in the large bowel, as it is sparingly absorbed from the gastro-intestinal tract. Previous experience had indicated that the treatment of bacillary dysentery with this drug had given better results than the accepted treatment with sodium sulphate. To confirm this, the clinical progress of patients was observed from the time of their admission to the ward until clinical cure was attained, and the results were recorded on comprehensive graphs.

Drug Therapy.

A routine procedure was established in the ward, whereby every patient on his admission to it received three sixty grain doses of sodium sulphate at intervals of one hour. Alternate patients were then given either sulphaguanidine or sodium sulphate. These patients receiving sulphaguanidine were given seven grammes as an initial dose, followed by 3·5 grammes every four hours for one or two days. The drug was then administered in doses of 3·5 grammes every eight hours for six or seven days. Patients receiving sodium sulphate were given sixty grains every four hours for the next twenty-four hours, then every eight hours for four to six days. Both of these routine methods of treatment were supported by rest in bed and a suitable diet.

A series of five diets was used; the first diet consisted of fluids only, and the second, third, fourth and fifth diets were graduated up to full hospital diet. No milk was included until the fourth diet, which was a non-roughage diet and was varied only as very limited supplies would permit. Rest in bed was maintained until the stools numbered less than three per day and were semisolid or formed in type.

Diagnosis and Progress.

Before any patient was accepted into the series, it was necessary that the bacteriologist should report that the stools were typical of bacillary dysentery. The presence of typical bacillary exudate with or without the growth of a culture of *Bacterium dysenteriæ* was accepted as a standard of diagnosis, as was also the presence of an indefinite exudate associated with the cultural production of *Bacterium dysenteriæ*. In this way a minimum number of four stools was sent for examination unless a culture of *Bacterium dysenteriæ* was reported in the meantime. Stools passed between the hours of 6 p.m. and 8 a.m. were placed in a fly-proof cupboard in the annexe and were retained for inspection by the medical officer each morning. Patients were instructed to note the number of stools passed during each twenty-four hours, and this was recorded daily.

According to the clinical manifestations, cases were conveniently divided into three groups, "mild", "moderate" and "severe". The moderate type was the commonest.

The average length of time spent in bed was eight to ten days. The first sigmoidoscopic examination was made on the day after the patient sat out of bed, and subsequently the examination was repeated every seven days until the mucous membrane of the bowel was observed to be normal. Generally two or three sigmoidoscopic examinations were necessary.

The clinical response to treatment was assessed by noting the temperature and the number and macroscopic appearance of the stools, and by making repeated sigmoidoscopic examinations until the bowel was normal.

The following two case reports are typical of the series. Further information is given in the graphs (Figures I and II).

Reports of Cases.

CASE I.—Private P.J.B., aged twenty-two years, was admitted to hospital on July 21, 1942, complaining of abdominal pain and diarrhœa of three days' duration (Figure I). On examination, his temperature was found to be 97° F. and his pulse rate 72 per minute, and his respirations numbered 18 per minute. His tongue was coated with moist, brownish-white fur and the lower part of his abdomen was

moderately tender, the maximum tenderness being over the right iliac fossa. General examination otherwise revealed no abnormality. Macroscopic examination of the stools soon after his admission to hospital revealed blood-stained mucopus. Microscopic examination revealed a typical bacillary exudate. The patient was treated with routine diet and sodium sulphate. On the third day after his admission to hospital, the pathologist reported a culture from the stools of *Bacterium dysenteriæ* Flexner. Subsequent progress until the eleventh day of the disease can be observed on the graph. At this stage sigmoidoscopic examination to 17 centimetres showed the mucous membrane to be moderately congested. Further sigmoidoscopies on the sixteenth and twenty-third days revealed a gradual return of the mucosa to normal.

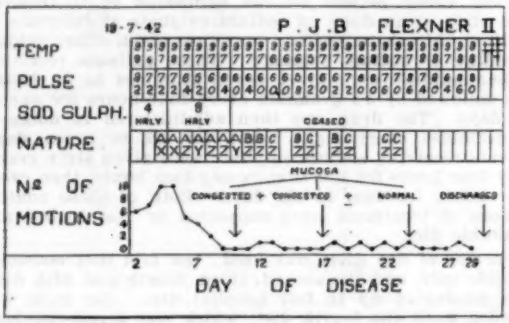

FIGURE I.
A = liquid fæcal; B = semisolid; C = formed; X = blood and mucus; Y = mucus; Z = no exudate.

CASE II.—Lance-Bombardier A.G.S., aged thirty years, was admitted to hospital complaining of abdominal pain, diarrhœa and backache of one day's duration (Figure II). He stated that during the previous twenty-four hours he had had approximately twelve bowel actions and had felt nauseated, but had not vomited. On examination, his temperature was found to be 102° F. and his pulse rate was

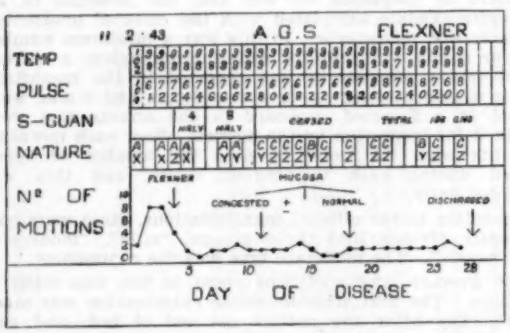

FIGURE II.
A = liquid fæcal; B = semisolid; C = formed; X = blood and mucus; Y = mucus; Z = no exudate.

104 per minute; his respirations numbered 20 per minute. The tongue was coated with a thick white fur, the lower part of the abdomen and left side of the hypochondrium were tender to palpation. The general physical examination otherwise revealed no abnormality. After the routine administration of three doses of sodium sulphate, he passed several stools containing blood and mucus. Microscopic examination revealed a typical bacillary exudate, and *Bacterium dysenteriæ* Flexner was isolated on culture. Sulphaguanidine therapy was begun on the third day after his admission to hospital. There was a good response to treatment, as shown in Figure II. Sigmoidoscopic examination to 15 centimetres on the eleventh day revealed that the mucosa of the bowel was slightly congested. When the examination was repeated on the eighteenth day, the appearance of the mucosa was normal.

Discussion.

Keogh, Hone and Andrew have shown that "there is a definite correlation between the severity of the attack at onset, and the duration of the disease". This statement is in accordance with the impression gained in this series of cases, that the severity can be judged by the maximum number of stools passed at the onset of the illness.

In Table I are summarized the results that were obtained in this series of cases. It will be observed that in general patients were not admitted to hospital at the onset of the attack. The average number of stools passed in the first twenty-four hours after admission to hospital was eight in the sodium sulphate treated group (27 cases) and nine in the sulphaguanidine treated group (24 cases).

TABLE I.

Period.	Sodium Sulphate Series.		Sulphaguanidine Series.	
	Average Number of Days.	Number of Cases.	Average Number of Days.	Number of Cases.
From onset until stools finally normal	17·7	24	12·5	18
From beginning of treatment till stools finally of normal appearance	15·7	26	8·4	20
From onset till stools finally less than three per day	12·1	27	6·5	21
From beginning of treatment till stools finally less than three per day	11·7	27	3·6	24
From onset till sigmoidoscopic findings finally normal	25·08	23	21·4	22
From beginning of treatment till sigmoidoscopic findings finally normal	24·4	26	17·5	24
Days of disease preceding patient's admission to hospital	2·9	21	3·5	24

It will be noted from the table that, according to the accepted criteria of cure, sulphaguanidine shortened the duration of the illness by seven days in comparison with sodium sulphate.

Summary.

1. In a series of cases of bacillary dysentery, sulphaguanidine has shown its value as a most efficient drug.

2. Twenty-six patients were treated with sulphaguanidine preceded by three doses of sodium sulphate, and 31 patients were treated with sodium sulphate alone. Every patient treated with sulphaguanidine had a rapid reduction in the number of stools passed during the early stage of treatment. This is considered to be a physiological result due to the action of the drug on the *Bacterium dysenteriæ* rather than to any astringent or sedative effect on the bowel itself.

3. Under sulphaguanidine therapy, the clinical condition rapidly improved. Patients had less toxæmia, quick increase of appetite and rapid loss of abdominal discomfort and tenderness.

4. Sigmoidoscopic examination of the rectum and sigmoid colon showed that for patients treated with sulphaguanidine the period necessary for the mucosa to return to normal was shorter than for those treated with sodium sulphate.

5. No toxic symptoms were observed, nor was any rash apparent which could be attributed to the drug.

6. Constipation during the third to fifth days was moderately frequent in the earlier cases of the investigation. This, however, was later controlled by reducing the daily dosage from 17·5 grammes after the first twenty-eight hours.

7. Complications were rare in both groups. Nothing more serious than conjunctivitis occurred.

Acknowledgements.

I am indebted to Lieutenant-Colonel I. J. Wood for his assistance and advice in the preparation of this paper, and to Lieutenant-Colonel L. E. Rothstadt for his cooperation with the clinical work. Major-General S. R. Burston, Director-General of Medical Services, has kindly given permission for publication.

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THE USE OF THE CHORIO-ALLANTOIS OF THE DEVELOPING CHICK EMBRYO IN THE DIAGNOSIS OF SMALLPOX.

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ONE of the chief difficulties in the diagnosis of smallpox, in so far as it affects the quarantine or health officer, lies in distinguishing mild variola from chickenpox. Various laboratory aids to diagnosis have been devised—some serological, others depending on animal inoculation. Of the latter type of test, that of Paul[1] is probably the most widely used. In this test, material from skin lesions is applied to the scarified cornea of the rabbit, and the result may be read in forty-eight hours. Whilst a characteristic change in the cornea follows the inoculation of material containing living variola or vaccinia virus, material from cases of chickenpox gives no specific reaction. The Paul test, however, has not given complete satisfaction in the United States of America, as is evident from the reports of authors quoted by Bohls and Irons.[3]

Since Lazarus, Eddie and Meyer[3] reported in 1937 the propagation of variola virus on the chorio-allantois of the developing chick embryo, Buddingh,[4] Irons *et alii*[5] and Bohls and Irons[2] have suggested infection of the chorio-allantois as a diagnostic test for smallpox. Chickenpox lesions have not been produced in the developing egg.[3] Our own experience, although we have had access to material from only a single case, leads us to believe that the use of the developing egg may assist in the diagnosis of smallpox.

History of the Patient: Collection and Storage of Specimen.

The patient (J.H.B.), a male, aged sixteen years, was a "contact" of a person who became ill on March 24, 1942, and died from confluent smallpox on the sixth day. After the fact had been established that he had been a "contact" of this fatal case, J.H.B. was vaccinated for the first time on March 31; but on April 7 he became ill and was isolated, as he was considered to be suffering from smallpox. He developed a profuse rash and was at first seriously ill; but his condition improved about the end of the first week, the improvement coinciding with the injection of blood from a person who had exhibited a primary Jennerian vaccination response. On April 23 he commenced to shed crusts, and on April 27 some of these were collected, placed in a suitably sealed bottle and forwarded to these laboratories.

Experimental Work on Rabbits.

The specimens remained at the ordinary atmospheric temperature during transit, but on their arrival here on April 29 they were stored at −8° C. (18° F.). No opportunity occurred until August 29, 1942 (four months after collection), to perform animal experiments, when some of the crusts were used for carrying out the Paul test. Minute chalky granules were observed in the fixed cornea, but these were not considered sufficiently characteristic to establish a certain diagnosis of smallpox. The test was repeated on August 31 with substantially the same result. At the same time attempts were made to propagate the variola virus on the shaven skin of the rabbit, crusts ground up in normal saline solution being used as the inoculum. Two rabbits were used. One showed no reaction, whilst the other developed a confluent non-vesicular eruption which was commencing to form scabs at seventy-two hours. On the fifth day the scabs were scraped off the skin and ground in a mortar with a 50% solution of glycerol in water. The resultant thick suspension was applied to the skin of other rabbits, but without effect in any instance. The result of a Paul test carried out with some of the first passage material was equivocal. These results are in conformity with the statement of Horgan,[6] that "there is general agreement with regard to the difficulty of producing lesions in animals other than the monkey with human variola or alastrim".

Propagation of the Virus on the Chorio-Allantois.

On April 16, 1943, two of the remaining crusts were placed in a mortar, together with two millilitres of physiological saline solution containing 10% of normal horse serum ("serum saline"). After standing for one hour the crusts disintegrated almost completely with very little grinding. The resulting turbid fluid was not centrifuged. Part of it was diluted to 1:10 and 1:100 with "serum saline", and chorio-allantoic inoculation was carried out substantially according to the technique of Burnet.[7]

The eggs were examined three days after inoculation of the chorio-allantoic membrane, with the results shown in Table I. Some membranes developed discrete pocks, which

TABLE I.

Result of Inoculation of Chorio-allantoic Membranes with Original Variola Material from Patient J.H.B.[1]

Dilution of Original Fluid. (1 mil per Crust.)	Number of Eggs Inoculated.	Result.
Original fluid undiluted.	8	One embryo dead. Remainder show confluent growth.
1:10	8	Discrete to semi-confluent pocks in all.
1:100	7	One embryo dead. Remainder show discrete pocks (approximately 30 to 40 per membrane).

[1] Approximately 0·05 millilitre of inoculum was used per membrane. Eggs were incubated for 11 days prior to inoculation and the membranes were removed and examined after a further three days' incubation at 35° or 36° C.

appeared as small, well-defined, somewhat translucent, dome-shaped elevations. When the membranes were cut out and immersed in formol saline solution, the pocks became densely opaque. The majority were found to have a diameter of approximately 0·5 millimetre (Figure I). The more heavily seeded membranes showed confluent lesions and appeared pale grey with much thickening and œdema. Hyperæmia and small hæmorrhages were much less evident than is the case after inoculation with vaccinia virus. Similar results were obtained when the inoculation was repeated with material prepared from another crust. The pocks at forty-eight hours were similar to those produced in seventy-two hours, described earlier, although somewhat smaller.

It is to be noted that the original crust suspension in "serum saline" was found to be heavily contaminated with bacteria. The chorio-allantois apparently did not dispose of all the contaminants, as the first egg passage virus suspension proved grossly contaminated.

Some of the original crust suspension prepared on April 16, 1943, and stored in the refrigerator at 4° C. was found to contain living contaminants ten days later (April 26). However, a bacteria-free suspension of virus was obtained from egg membranes inoculated with further 1:10 and 1:100 dilutions on that day. Seventeen successive egg passages were carried out over a period of six weeks, and

the appearance of the lesions remained constant. From about the sixth passage onwards, however, it was noticed that a heavy inoculum of virus killed 50% or more of the embryos after three days' incubation. In this respect our experience was somewhat different from that of Irons and his associates.[3]

A Paul test carried out with virus of the thirteenth egg passage gave a result which was regarded as positive.

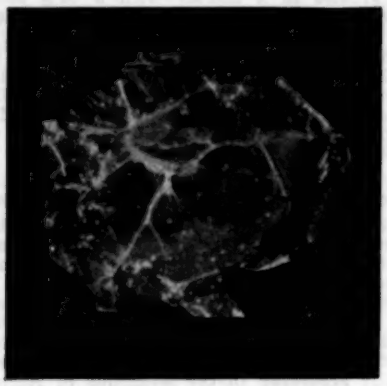

FIGURE I.

Photograph (natural size) of membrane showing typical discrete virus foci of variola after two days' incubation.

The characteristic appearances of membranes forty-eight hours after inoculation with dilute suspensions of variola and vaccinia viruses are shown in Figures I and II. The membrane infected with variola (Figure I) from the last egg passage carried out, contrasts strikingly with the membrane inoculated with vaccinia (Figure II). (The strain of vaccinia virus used in this instance was one ("F") isolated by chorio-allantoic inoculation from an accidental infection of a human, and it had reached the sixth egg passage.)

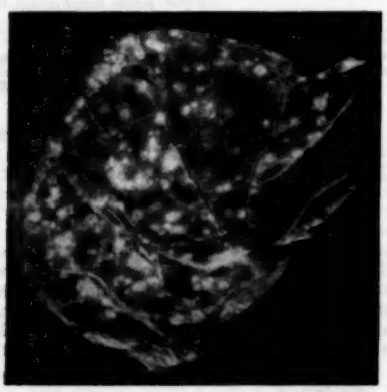

FIGURE II.

Photograph (natural size) of membrane showing typical discrete virus foci of vaccinia after two days' incubation. The vaccinal lesions are characterized by the central depression or "umbilication" of the pocks, which are also larger and have less sharply defined margins than those of variola.

For the growth of the variola virus, eggs from the tenth to thirteenth day of development have been found satisfactory. After inoculation a temperature of 35° C. has been maintained.

Discussion.

Our results are in general agreement with those of Buddingh,[4] who propagated the variola virus in the egg from material which failed to give a positive result macroscopically with the Paul test. Recent work carried out at these laboratories[5] also indicates the greater sensitivity of the chorio-allantois as a means of demonstrating vaccinia virus.

In addition to its greater sensitivity compared with the rabbit's cornea, the developing chick membrane has further possible advantages as a diagnostic aid. A positive reaction to the Paul test is given by both variola and vaccinia viruses. The appearance of the foci produced on the chorio-allantois enables distinction to be made between variola virus and the strains of vaccinia virus encountered by us and by other workers.[3,4] Once the virus has been propagated on the egg, confirmatory evidence of identity, if needed, may be obtained by means of the Hirst phenomenon.[6]

The advantage of being able to distinguish rapidly between the variola and vaccinia viruses is not merely a theoretical one. On the discovery of a case of smallpox, all contacts of the patient are vaccinated at the earliest possible moment, and sometimes difficulty has been found in deciding whether a contact has developed smallpox or generalized vaccinia.

The equipment necessary for carrying out virus investigations in the developing chick embryo is not elaborate, and provision of facilities for such work in the vicinity of the larger quarantine stations would afford advantages in other directions besides that of facilitating the diagnosis of smallpox. To mention only one possibility, such equipment would prove helpful for research in the event of the appearance of an influenza pandemic such as that which followed the last world war.

Summary.

1. Variola virus has been propagated on the developing egg, from smallpox crusts stored at temperatures below 0° C. for one year.

2. The developing egg may prove a more sensitive medium than the cornea of the rabbit for the diagnosis of smallpox.

3. By use of the developing egg as a medium, variola and vaccinia viruses may be distinguished.

4. These results are in conformity with those reported by certain observers in the United States of America.

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THE LEPROMIN TEST IN LABORATORY ANIMALS

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THE lepromin test carried out on human subjects with Hansen's emulsion has received a considerable amount of attention; but comparisons of tests with Hansen and Stefansky emulsions have been made only by Muir (1933). Similar comparisons of the tests on animals do not appear to have attracted attention, although Rodriquez (1938) tested animals with human lepromin made by Mabalay's modification of Mitsuda's technique. He obtained positive results in the goat, rabbits and adult dogs; but young puppies gave negative results.

Much discussion has taken place on the question whether the reactive element is a simple bacillary quality or is a cellular-bacillary combination. On the other hand, it has been suggested that the cellular material has a retarding influence on the reaction, and that if this tissue element is eliminated the reaction may assume specific characteristics. My attempts to produce a bacillary emulsion by digestion were not satisfactory. However, Dharmendra (1942) has modified the chloroform method suggested by Wherry (1909) and successfully separated the organisms from the tissue element. Being devoid of cellular interference, it speeds up the reaction, but it has not a specific character.

Experimental Methods.

A mixed cellular-bacillary suspension was used in Series I. Table I contains the results obtained with two human and two rat emulsions, A, B and C, prepared by Muir's technique, while D is a simple washing of a long-standing ulcer of a rat. All were made up with 0·5% solution of carbolic acid in saline solution and sterilized at 120° C. for half an hour.

In this series all reactions were at their maximum in sixteen to twenty-two days. The mice were in a state of collapse at the conclusion of the injections, but they recovered in a few hours' time.

Bacillary suspensions were used in Series II. This series contains the results obtained with one human and two rat emulsions suspended in 0·5% phenol in saline solution, sterilized at 120° C. for half an hour. E was prepared by digestion in a 10% solution of pancreatin in 10% caustic soda solution, and thereafter was well washed and centrifuged in saline solution. The results obtained with this emulsion were variable. The maximum reaction in the dog was recorded in nine days, while the rabbits and guinea-pigs showed the peak in about fourteen days. Emulsions F and G were prepared in accordance with the technique of Dharmendra. The reactions in the normal animals reached the maximum in two or three days. This finding follows closely Dharmendra's results with Hansen lepromin in the human subjects. However, in the case of the tuberculous rabbit, only emulsion F gave a reaction which reached the maximum on the twelfth day. All reactions were of the Mitsuda type; but some animals giving positive results showed an erythematous primary reaction, while a number of animals recorded as giving negative results showed vesication and desquamation.

The only animal included in both series of experiments was the leprous rat, which had been inoculated nine months previously.

Comparison of Mixed and Bacillary Antigenic Activity.

Until recently the lepromin tests have been carried out with mixed cellular-bacillary suspensions prepared by the Mitsuda or Muir technique. It has been impossible, therefore, to decide whether the reaction was one of a simple bacillary protein or of mixed proteins of tissue and bacilli.

As previously pointed out, Dharmendra has introduced a simplified bacillary lepromin, which obviously contains the reactive properties. A comparison of results with both types of lepromin emulsions is therefore made possible.

TABLE I.

Series I. Intradermal Inoculations with 0·3 Cubic Centimetre of each Emulsion.[1]

Lepromin.	Tissue.	Source.	Amount of Tissue and Saline Solution.	Breed Count per Cubic Centimetre.	Rabbits (2N).	Guinea-pigs (3N).	Guinea-pigs (4S).	Rats (3N).	Rats (6S).	Rat (Le).	Mice (4N).
A	Human (F).	India.	0·4 gramme to 100 cubic centimetres.	18×10^3	(1) 3P	(1) 3P	—	—	—	—	—
B	Human (AF).	Papua.	0·2 gramme to 100 cubic centimetres.	18×10^3	—	—	—	—	—	—	—
C	Rat (AF).	Local.	0·1 gramme to 100 cubic centimetres.	21×10^3	(2) 3/4	(3) 3–5	(4) 3–5	—	—	—	—
D	Rat (F).	Local.	1·0 to 50 cubic centimetres.	15×10^3	(1) 7 × 4	(1) 3·5	(4) 3–5	—	—	—	—

TABLE II.

Series II. Intradermal Injections were E, 0·3 Cubic Centimetre, F and G, 0·25 Cubic Centimetre.[1]

Lepromin.	Tissue.	Source.	Tissue and Saline. Grammes.)	Breed Count per Cubic Centimetre.	Rabbits (4L).	Rabbits (4Sm).	Rabbit (Tb).	Dog (L).	Cat.	Guinea-pigs (4L).	Guinea-pigs (4Sm).	Guinea-pigs (6V).	Rats (4L).	Rats (6Sm).	Rats (7Le).	Mice (4).
E	Rat (F).	Local.	? to 50	21×10^3	(2) 5/6	—	?	10 P	—	(4) 3–6	(1) 5	(4) 4–6	—	—	—	(1) BU
F	Rat (AF).	Local.	0·3 to 75	15×10^3	—	—	3	—	—	(4) 3–6	(1) 3	(4) 2–5	—	—	—	?
G	Human (AF).	Papua.	0·5 to 75	6×10^3	—	—	—	—	—	(4) 2–6	(1) 3	(5) 3–7	—	—	—	?

[1] Ordinary numerals represent the size of the reaction in millimetres; numerals in parentheses are the number of animals; AF = alkaline fixation; BU = badly ulcerated; F = fresh tissue; L = large animals; Le = leprous rats to 9/12; N = stock animals; P = pustular induration; S = suspect leprosy animals 7/12; Sm = small animals; Tb = bovine tuberculosis 7/52; V = virulence test animals; Emulsions B and G were prepared from the same human nodule, and C and F from the same rat nodule; " — " indicates no reaction.

In the present investigation both these emulsions have been prepared from human and rat leprosy material. They were tested on various animals, but these tests are not strictly comparable, since only one animal was included in both series.

Human material has been prepared as mixed cellular-bacillary lepromin A and B; A produced only two positive results and B none of 23 animals tested simultaneously. Lepromin G, a simple bacillary lepromin prepared from the same tissue as B, gave ten positive results in 46 animals tested.

Rat lepromin was similarly prepared, and lepromin C and F were obtained from the same rat tissue by the techniques of Muir and Dharmendra. Lepromin C produced nine positive reactions in 23 animals and lepromin F produced ten positive reactions in 46 animals.

It is of interest to note that while the Dharmendra bacillary lepromin F produced a speeding-up of the reaction in animals and had a tuberculin time factor, the bacillary digest E produced a reaction not very different from that produced by the mixed cellular-bacillary lepromin.

Antigenic Activity and Acid-Fastness.

The parallelism of acid-fastness and antigenic activity has received attention, but it remains a controversial subject. Hayashi (1933) and Nagai (1938) hold that loss of acid-fastness of the organisms does not affect antigenic activity. On the other hand, Kitano and Inoué (1941) hold that partial destruction of both these qualities occurs by the use of an ultra-supersonic wave.

Dharmendra considers the soluble antigen of lepromin to be unaffected and therefore thermostable after sterilization at 120° for half an hour. Hayashi (1933) and Fielding (1934) noted independently that acid-fastness was destroyed by hot, weak acid, while the latter holds that the same effect is achieved by prolonged boiling in distilled water.

In view of the writer's claim that alkaline treatment of organisms tended to a binding of acid-fastness, it was considered that tests of emulsions of fresh and alkaline fixed tissues might throw some light on the question of such parallelism. Tests carried out with human lepromin from fresh tissue A produced positive results in two rabbits of the 23 animals tested, while the same animals gave negative results with emulsion B, which was prepared from an alkaline fixed tissue. It should be noted that the latter emulsion contained ten times the number of organisms contained in A.

According to Fielding and Cochrane (1944), the same type of emulsions produced negative results with A and positive reactions with B in two human subjects. Animal tests with rat emulsions produced nine positive results in 23 animals tested with an alkaline fixed tissue C and six positive results in the same animals with tissue D, which was prepared by washing a leprous ulcer; emulsion C contained a larger number of organisms.

Our inability to obtain fresh human material was responsible for no attempt being made to compare the results of tests with pure bacillary emulsions on animals.

Lepromin Test and Immunity.

That rat leprosy can be maintained serially is well known; but the question of resistance or immunity is uncertain. Claims that such a condition exists in humans and rats have been made repeatedly. Dean (1905), in his work on rat leprosy, isolated a diphtheroid, which he held agglutinated the serum of leprous but not of normal rats. Wherry (1909) injected killed rat organisms before injecting live ones, and held that they had a retarding effect on infection. Markianos (1930) made a similar claim for defatted organisms. Watanabe (1937) contended that this did not occur with killed human organisms or when the killed rat organisms were injected subsequent to the infecting dose.

Claims that positive reactions to lepromin tests are an indication of resistance or immunity have been made, and Rodriguez divides his animals into two classes—namely, "negatives", as being susceptible, and "positives", as being immune. I would draw attention to the difficulty of producing infection in monkeys; yet his lepromin tests produced negative results.

Rabbits appear to give variable results with both human and rat lepromin. Of eleven normal animals tested, one gave a positive result with the former and four with the latter, while both Rodriguez's animals gave positive results with human lepromin.

When live organisms were injected subcutaneously into rabbits, the primary reactions were somewhat different from those obtained in rats. In the latter they were early and were either absorbed or ulcerated; in the rabbits they were either absorbed or persisted, increased in size and appeared as cellular non-vascular nodules (which contained virulent organisms). After some weeks these nodules broke down to discharge pus, which could be effectively inoculated into rats. However, it is pointed out that rabbits given repeated subcutaneous or intravenous inoculations, or both, over a period of some months, showed no signs of a generalized infection.

Guinea-pigs appear to give more uniformly positive results to the lepromin test. Out of 21 injected, 11 gave positive responses to the human type and 16 to the rat type. On inoculation with living organisms the primary reaction was large and early. Such reactions either were absorbed or else ulcerated. On scarification and rubbing with infective organisms, a variation occurred in the persistence of the organisms in the skin. In some cases they disappeared in a day or two, but in others they persisted for some weeks. As in the rabbits, post-mortem examinations revealed a lack of generalized lesions in these animals.

Statements have been made that young children and young rats have a lowered resistance, which increases on aging. In the present series of lepromin tests it will be noted that the rats, both young and old, as well as infected, all gave uniformly negative results. Of the rabbits tested, all four young ones gave negative results, while five of seven older ones gave positive results with one or other of the lepromin emulsions. Out of four young guinea-pigs, one only gave a positive result, while the majority of older animals gave positive results with both human and rat lepromin.

If variation of receptivity and maintenance of living organisms, peripherally or deep, is taken as an index of variable resistance, then the lepromin test is not always an indicator of it.

To judge from the experiments of Rodriguez and from my own, it would appear that rats always give negative results. Rats, however, when apparently in the same general good health, show definite variation in their reaction towards living organisms inoculated under identical conditions. Inoculated subcutaneously with living organisms, then after some weeks by scarification, three rats showed variation in receptivity. The first rat showed no signs of organisms in smears of the skin at any time; neither were there any internal signs of organisms at post-mortem examination thirty-six days after the latter inoculation. A similar condition was noted in two rabbits inoculated with live organisms at the same time. The second rat had loose organisms in the skin after the first twenty-four hours and onward, but at twenty-one days they had disappeared; a post-mortem examination was made at this stage, and although no macroscopic lesions were found, organisms were recovered from the heart, kidney, spleen and liver. The third rat had loose organisms in skin smears for ten days, when it was noted that the smears contained intracellular organisms. From the first obvious general infiltration and thickening of the skin took place at the site of the latter inoculation. After a lapse of nearly five months from the latter inoculation the rat was almost moribund and had to be killed. On post-mortem examination the major portion of the internal organs, including the stomach, were found to be the site of a generalized infection of leprosy.

Summary.

1. The lepromin test in animals appears to give variable results, except in the case of rats, which consistently fail to react. This applies to both human and rat emulsions.

2. Comparisons of bacillary and mixed cellular-bacillary antigens reveal a distinct speeding up of the reaction with Dharmendra's bacillary antigen.

3. Comparison of emulsions of fresh and of alkaline-fixed tissue shows some slight variations.

4. Although it is uncertain, there does appear to be some evidence of resistance in different animals; this, however, is not always revealed by the lepromin test.

Acknowledgements.

Thanks are due to Professor Harvey Sutton for permission to carry out the investigation; to Dr. R. G. Cochrane, of Madras, for the inauguration of the work; and to Mr. G. Merritt and Mr. J. Sutherland for assistance and care of the animals.

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Reports of Cases.

A CASE OF TORULOSIS.

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Clinical Record.

A MALE PATIENT, C.J.F., aged fifty-eight years, was admitted to the Geelong Hospital on September 1, 1943. The history given by his private doctor was as follows. On August 23 signs of a left basal pleurisy had developed, and the patient's temperature had risen to 101° F. The temperature fell to normal on August 26, and the chest signs and symptoms subsided. On August 29 he began to show signs of cerebral irritation; this increased, some neck rigidity appeared and a double Kernig's sign was elicited. He had vomited on August 29.

Examination of the patient on his admission to hospital revealed that he was a thin, elderly man; he was apprehensive and complained of a severe headache. Neck stiffness was pronounced, and Kernig's sign was elicited. The tongue and mouth were filthy and the palatal and faucial areas were reddened. No abnormality was detected in the chest and heart. His temperature on admission to hospital was 98·4° F., his pulse rate was 92 per minute and respirations numbered 20 per minute. Lumbar puncture yielded turbid fluid, under a pressure of 160 millimetres, with a yellow sediment on standing; 1,800 cells were present per cubic millimetre, nearly all being polymorphonuclear leucocytes. The chloride content of the fluid was estimated at 640 milligrammes per 100 cubic centimetres. An attempt at culture from the fluid was made, but no growth was obtained in twenty-four hours. The patient was given 12 grammes of sulphapyridine during the first twenty-four hours.

Next day the patient's condition was worse; he was semi-comatose and irritable, and neck retraction was most pronounced. His temperature varied from 97·6° F. to 101·8° F., his pulse rate from 78 to 120 per minute, and his respiratory rate from 20 to 36 per minute. On lumbar puncture the fluid was found to be more turbid, and the pressure had now risen to 200 millimetres. The urine contained 0·2% of sugar, but no albumin. A white blood cell count revealed 43,150 leucocytes per cubic millimetre. The sulphapyridine therapy was stopped, and he was given 14 ampoules of "Soluseptasine" in the next twenty-four hours.

Next day he grew rapidly worse, and died at 11·40 p.m. Before his death his temperature had increased to 104° F., his pulse rate to 130 per minute and his respiratory rate to 60 per minute. During this last period he had received ten more ampoules of "Soluseptasine" intramuscularly. In the meantime from cultures and from the cerebro-spinal fluid two organisms had been isolated. One was the oval, yeast-like organism to which Stoddard and Cutler gave the name *Torula histolytica*, though both Freeman and Fairley state that the term "histolytica" is a misnomer. In this case a high percentage of the fungus in the budding stage was present. The other organism was a hæmolytic streptococcus, and it was probably due to the added presence of this organism that the patient's demise was so rapid. The diagnosis was confirmed by Dr. Lucy Bryce, of Melbourne.

Comment.

Fairley states that the average duration of these cases is about four months, but that acute cases are recorded which proved fatal within three weeks. The known period of illness in this case was eleven days, but the patient may have been ill for some time before he consulted his doctor, particularly as Fairley states that fever is generally absent in this disease and that the onset is insidious.

Both Fairley and Price state that no treatment is of any use in the cerebro-spinal type of torulosis. This patient gave no response to treatment with sulphapyridine in what is usually considered adequate dosage for meningeal conditions. Perhaps some research institution could investigate the possibility of obtaining a successful result by the use of penicillin or sulphaguanidine.

A case of torulosis was reported in the *Royal Melbourne Hospital Clinical Reports* in December, 1941, and by Sawers and Thompson in 1935.

Acknowledgements.

I am grateful to Dr. Lucy Bryce for help and advice in this case, and to Miss Crellin, the hospital biochemist, for her able laboratory work.

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Reviews.

ESSAYS AND LITERARY SKETCHES.

"ESSAYS AND LITERARY SKETCHES" by Professor W. A. Osborne is a meritorious achievement.[1] He worthily adds to the list of our profession who have made their mark by straying in prose from the narrow path of their specialty. It is regrettable that owing to wartime limitations the list of sketches had to be curtailed.

The author in easy flowing style picks out incidents over a wide field and weaves around them a story based on keen observation and wider reading.

We wonder how many of us realized that Thomas Carlisle was a mathematician, that Oliver Goldsmith wrote two volumes on philosophy, that Marat, the implacable man of blood, was a distinguished physician on whom the University of St. Andrews in Scotland had bestowed a doctorate, and that he introduced Newton's optics into France.

Those who suffer from astigmatism will in "Nero and His Emerald" be interested to follow Professor Osborne in a discussion of the life story of Samuel Pepys struggling with his diary, or to gaze on Nero at the circus looking at the games through an emerald.

The chapters are short—the reader may remark too short—but the fault has at least the merit of permitting a wider range of topics. There is one on Hannibal's methods of splitting the rocks which barred his path, another on the Brontes in Ulster, and a third on the author's experience as a diver at Broome.

There is a happy essay on "A Walk through a Hospital in 1834". It gives a vivid picture of forgotten days. A house surgeon comes out perspiring. "Some of you distinguished surgeons had better come in and give me a hand; it's a case of shoulder dislocation, and the fellow is a Hercules." They troop in to find a coal heaver lying on a mat, his grimy shirt has been removed, and a splendid if unwashed torso is manifest. The direction of one arm is obviously wrong. "Now, Smith, you're the champion with the fancy, lie down and get your instep into his armpit and pull his arm with all your strength, two others pull on the upper arm downwards and outwards; two others pull here on this towel, I'll take his head." They pull till the veins stand out on their necks; the patient groans deeply, but the dislocation remains. "Nothing for it but the pulley and tackle", and the house surgeon begins to disentangle some ropes which have been fastened to cleats on the wall, and a great sheave swings above them.

Often the author skilfully disguises the theme of his discourse. Thus "In the Time of Diocletian" is an essay on the part which the young science of mathematics was playing in the life of the intellectuals. "A Shower of Rain" introduces the theme of man's aversion to a cold douche. It has been a vital factor in wars, and in 1794 changed the face of civilization by clearing the streets of those in favour of "the reign of terror".

In "Sufferings of the Great" Professor Osborne pays tribute to the art of the late Charles Maclaurin and adds new hypotheses. Napoleon suffered from Malta fever. Sir Walter Scott and Robert Clive of India both suffered from gallstones.

Perhaps the most unexpected chapter is that which deals with "A Bird of Evil". It is none less than our old friend the kookaburra, who is accused not merely of cowardice, but of wanton slaying of the wagtails and other birds, upon which we depend to keep down the insect pests. If the facts are as stated, this chapter should be given a wide publicity. The cult of kookaburra needs reshaping in the line of common sense. Our author has no doubts as to where this bird should be placed. "It is amid the blasphemous cachinnation of the Witches' Sabbath that I can imagine the kookaburra at home, and horribly voluble, leading the chorus among the poisoners and baby-stranglers and all the meaner fiends of the underworld."

In word magic and meaning there is an interesting criticism of Keats's "The Eve of St. Agnes".

The poem opens with a description of a hard frost which makes the reader feel cold. The grass is frozen; even the carvings and metalwork seem to be congealed and suffering; it is dead calm, for the breath rises like incense; the beadsman's fingers are numb and the sheep are silent. Despite this painfully low temperature, fair Madeline removes all her clothing in a room with a large window and no fire, and in a state of pitiable nudity stands pensively in a day dream—a likely story. Then, when the young lady is asleep in bed, Porphyro sets a table and brings out viands. And what are they? Dates, candied apple and jellies. What a cold collation for such a night! Surely Angela could have managed to bring some hot Scotch broth.

There are many other topics, "Of Salt", "Moonlight", "Free Libraries", "The Spiral", "Fall of the Roman Empire", "Teuton Fury". The titles are intriguing. The reader will not be disappointed. It is to be hoped that this book will receive such a wide circulation as to stimulate the publication of another volume of literary essays.

[1] "Essays and Literary Sketches", by W. A. Osborne; 1943. Melbourne: The Lothian Publishing Company, Proprietary, Limited. 7¼" × 5", pp. 146, with one illustration. Price: 7s. 6d.

PASTEURIZATION.

MR. HARRY HILL in a small book discusses the necessity for pasteurization and answers effectively the criticisms often directed against its adoption.[1] He describes clearly the various processes employed in the pasteurization and preparation of milk for delivery, and deals adequately with the essential cleansing operations and control measures.

The book is to be recommended to health officers as a very convenient summary of an important subject, which is of especial interest at the present time. Illustrations are conspicuous by their absence, but the clarity of description is such that this does not detract seriously from the value of the book. Readers of page 138 may wonder how to use aseptic precautions.

[1] "Pasteurisation", by Harry Hill, F.R.San.I., A.M.I.S.E., F.S.I.A.; 1943. London: H. K. Lewis and Company Limited. 8½" × 5½", pp. 158. Price: 10s. net.

CHEST EXAMINATION.

A NEW little book entitled "Chest Examination", by R. R. Trail, has for its subtitle "The Correlation of Physical and X-Ray Findings in Diseases of the Lung"; but the author seeks not only to correlate, but also to explain how physical signs and abnormalities of shadow arise from departures from the normal in pulmonary structure and function.[2] The book is in four sections: the first is on applied anatomy; the second is on applied pathology (wherein the main changes induced by disease are related to the physical signs and abnormal X-ray shadows that they produce); the third is on physical examination (in which it is presumed that the reader has some experience of chest examination and knowledge of the principles underlying it); and the fourth is on "the abnormal film". As Sir Walter Langdon-Brown states in a foreword, the freshness of its approach will be patent to all. The author is not always elegant in his literary style. At times his applied anatomy and physiology are not easy to follow; for example, in the chapter on lung and mediastinal movement it is stated that "if there is a fall of pressure on one side of the thorax, there is an immediate automatic rise on the other; fibrosis on the right implies emphysema on the left". However, the book is stimulating and contains much useful information that is not found in most text-books on clinical examination. It is to be recommended ungrudgingly to physicians and radiologists and it may well enjoy a perennial popularity.

[2] "Chest Examination: The Correlation of Physical and X-Ray Findings in Diseases of the Lung", by Richard R. Trail, M.C., M.A., M.D. (Aberdeen), F.R.C.P. (London), with a foreword by Sir Walter L. Langdon-Brown, M.A., M.D., F.R.C.P., D.Sc., LL.D.; 1943. London: J. and A. Churchill Limited. 8½" × 5½", pp. 117, with 47 illustrations. Price: 10s. 6d.

The Medical Journal of Australia

SATURDAY, MAY 13, 1944.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

DISCIPLINE IN WARTIME.

It seems almost absurd that at this stage in the early months of 1944, when the war has lasted more than four and a half years, it should be necessary in such a freedom-loving country as Australia to discuss individual or collective adjustment to wartime conditions. There are plenty of signs, however, that this need does exist. Even if this were not so it would still be wise to pursue the subject, first of all because it is so fatally easy to be busied with the mote in the eye of another and to ignore the beam in one's own, and secondly, because in the absence of motes and beams even the best intentioned may become weary in well-doing. Mr. Winston Churchill has not long ago described as vain and foolish any thoughts that the war is all but over, and it is necessary to guard against wishful thinking that would take no notice of such a warning. This is particularly true for the vast majority of Australians, who have seen none of the devastation of cities and the slaughter of civilians that have been the fate of other countries.

If any man will give of his best in the present upheaval and contribute to its determination in favour of the democracies, it is above all things necessary that he have a clear idea of its origins and that he keep before his mind the declared objectives for which we are fighting, as set out in the terms of the Atlantic Charter. This may be regarded as a trite saying, but even so it must stand—had every member of the community full understanding and a constant and high fixity of purpose, there would be no need to discuss adjustment to wartime conditions. No one among us doubts that full and complete victory will in the end come to the allied nations, and every one will surely agree that if this victory is to be soon there must be a constant backing of the armed forces by those whose place is in what has so well been called the home front. This is not a question merely of the supply of munitions of war, of food and even of certain comforts; it has to do with that intangible and essential factor known as morale, which has its origin in the emotions and is displayed in every branch of behaviour. The subject of morale is of great interest and opens up fruitful avenues of discussion. The creation of morale may be undertaken to a certain extent by everyone, and it is well to remember that, given the right impetus among a receptive community, it will spread something in the same way as measles spreads among a people that has not known the disease. Medicine and its practitioners have something to do with the maintenance of morale, for the field of their endeavour covers everything that has to do with the bodily and mental welfare of man. This will be clear if we glance at a list of the menaces to morale that were enumerated in an address delivered recently by Commander E. L. Bortz, of the Medical Corps of the United States Navy.[1] He named the following twelve menaces: ignorance of objectives; ill health; inadequate diet; loss of sleep; continuous work without periods of rest and recreation; a task for which one is unfitted; idleness; boredom; strange and new type of existence; depressing news from home, or hysterical relatives; arguments between important national groups; predisposition to neurosis. But morale, though it is indispensable and pervades the whole warp and woof of a successful war effort, is only one of the essentials to the full and harmonious utilization for purposes of victory of the nation's resources. For this purpose morale must be attuned to discipline.

The word discipline has its origin in the Latin word *discipulus*, a disciple, and this in turn is derived from *discere*, to learn. In a military sense discipline is the means by which an armed force is enabled to respond promptly and efficiently to an order. It has been described as the key-note of military efficiency and morale, in that without it, uniformity, organized effort, and the effective working of the complex machinery of a successful military organization are impossible. It may be pointed out at once that discipline can be insensate and unreasoning and therefore unintelligent. In the same way obedience to that discipline may be quite prompt, but blind, and in its turn unreasoning and therefore unintelligent. This kind of obedience may be claimed as a manifestation of high morale, but no thinking person would claim for it the same value as an intelligent response to intelligently applied discipline. The Australian is above all an individualist; he has, to his credit, an independence of spirit that will not allow him to be coerced by bullying tactics. How was it that he earned for himself by his fighting qualities such high eulogies in the war of 1914-1918? How is it that in the jungles of New Guinea the Australian soldier, facing what are described as conditions hitherto unknown, is covering himself with glory equal in every way to that of the older A.I.F.? He could not do this if he were undisciplined. Colonel A. Graham Butler tells us in his "Official History" of the 1914-1918 conflict that the Australian Imperial Force evolved a discipline and methods of its own, the chief characteristic of which was an intelligent appreciation of the end in view. Let us translate all this to the Australian home front in the present war, to the men and women in the munitions factories, to those engaged in the production of food, to transport workers, to miners, to civilian medical practitioners, to men and women in ordinary industrial and commercial undertakings, to students in protected

[1] *Annals of Internal Medicine*, September, 1943.

faculties, yes, and to women and children in the home. Discipline they all must have in some form or other. To submit to unusual discipline in days of total war does not mean the giving away for all time of privileges or rights that have been hardly won, that is, provided certain conditions to be mentioned presently are observed. To submit in these circumstances to discipline freely and with understanding is to display intelligence. It may in fact be truthfully said that without discipline of some sort democracy in the true sense will never be attained. The most effective form of discipline and that which builds character more than anything else, is self-discipline. Self-discipline may be practised by those who comply with the disciplinary demands of total war. A proviso has been mentioned—the discipline must be applied in a reasoning and intelligent way; it must also be applied with equal fairness, and any discrimination shown must be dictated by strict justice when all the circumstances have been considered and not by favouritism. No untruths or even half-truths must be used with disciplinary methods, and what have been described as donkey and carrot devices must find no place in governmental control. To expect less of the Australian public in the way of understanding and obedience than is expected of Australian sailors, soldiers and airmen is to offer the people an affront. Complaints will often arise, for no administration is perfect, and irregularities and inequalities may be responsible. The remedy is prompt and searching inquiry followed by impartial decisions that will be put into effect. The whole affair is something like a chapter in preventive medicine. The public is the patient and the authorities are the doctors in consultation. The measures drafted to prevent illness and to promote rude health must be based on known facts and the patient's intelligent cooperation must be sought; if he will not understand and comply, coercion may have to be considered for the sake of everyone.

Current Comment.

PENICILLIN.

PENICILLIN and its virtues in the treatment of different kinds of infection in man have been discussed in these pages on two previous occasions. In the issue of August 21, 1943, an account was given of its discovery and of its elaboration by workers at Oxford. The conclusion was quoted that penicillin possessed some properties unknown in any antibacterial substance previously described. Mention was also made of the fact that M. E. and H. W. Florey had used the substance in the treatment of fifteen patients suffering from serious illness. In these cases the drug was given orally, intravenously or by intramuscular injection, and all the patients recovered. Reference was again made to this "unequalled and unobtainable" drug in the issue of December 11, 1943, when attention was drawn to the report issued by a committee of the National Research Council of the United States of America. The committee, of which C. S. Keefer was chairman, had used the drug in the treatment of five hundred patients suffering from a variety of conditions. It was shown that the drug may be given by the intravenous and intramuscular routes, that it may be used as a local application, and that it is ineffective when given by mouth, for it is destroyed by the hydrochloric acid in the gastric juice. The good results obtained by Keefer and his colleagues were mentioned and it was shown not to be a panacea. Since that time continuous work has been done on this subject; as it seems that before long some penicillin will be available in Australia for civilian requirements, further reference to the practical use of the drug is desirable.

The first number for 1944 of the *British Medical Bulletin* is devoted entirely to penicillin. It contains six special contributions by different members of the Oxford group of workers, and then a series of abstracts of papers from British literature dealing with different aspects of the subject. Most of the information required for our present purposes is contained in an article by L. P. Garrod on the properties and powers of penicillin as a therapeutic agent and in another on its clinical uses by E. M. Florey. Garrod states that penicillin combines enormous antiseptic power with such a degree of freedom from toxicity to the mammalian body that one thousand times the concentration necessary for therapeutic action can be produced in the blood without ill effect. Treatment with it is governed not by the fear of over-dosage, but only by an anxiety to employ so precious a remedy with the utmost possible economy. Penicillin is an unstable acid and the preparations used in therapeutics are its salts. The sodium salt used for systemic treatment is hygroscopic and somewhat less stable than the more easily handled calcium salt which is used mainly for local application. Potency is expressed in Florey or Oxford units, an arbitrary amount determined by comparison with a standard preparation. Pure penicillin would have a potency of at least a thousand units per milligramme; penicillin in present use is far from pure, and material with a potency of one hundred units or less per milligramme is quite satisfactory for clinical use. When purity is increased toxicity is diminished. Any untoward effects that occur are caused mainly by products of low potency and are thus due to impurities rather than to penicillin itself. Garrod goes on to explain that though in the presence of penicillin certain species of bacteria not only cannot multiply but slowly die, it is not clear whether this effect is bactericidal or bacteriostatic. More important from the practical standpoint is the fact that this effect is exerted as well in serum, blood or even pus as in a simple medium such as broth. Within wide limits the effect is also independent of the number of bacteria present. Penicillin exerts its action only on certain species of bacteria; it is in point of fact the most highly selective antiseptic known. Most of the susceptible species are Gram-positive. They include the three main pyogenic cocci (*Staphylococcus*, *Pneumococcus* and *Streptococcus pyogenes*), the gas gangrene group, *Bacillus anthracis* and *Corynebacterium diphtheriæ*. The only fully susceptible Gram-negative species are *Neisseriæ*, the gonococcus and the meningococcus. Among resistant organisms are the tubercle bacillus and almost all Gram-negative bacilli, including the typhoid-dysentery group (some of which are slightly sensitive), the genera *Brucella* and *Hæmophilus* and two frequent wound invaders, *Proteus* and *Pseudomonas pyocyanea*.

Before reference is made to the methods of treatment it will be well to mention the results of clinical trials and some "special considerations", both of which are dealt with by M. E. Florey. Among the 200 cases included in the earliest clinical trials at Oxford were examples of the following conditions: generalized infections accompanied by local lesions in bones, lungs and heart valves; acute mastoiditis; infections of the skin; infections of the conjunctiva, cornea and lachrymal sac; chronic blepharitis; chronic sinus infections; empyema; synovitis; and a miscellaneous collection of infective conditions. The causal organism in most instances was the staphylococcus. In others it was a streptococcus or a combined infection by both organisms. A few infections were pneumococcal, gonococcal or due to actinomyces, and occasionally no organism sensitive to penicillin could be isolated. Of the 200 patients, 143 recovered completely, 43 manifested improvement and 14 gave little or no response. The fact that most patients treated in the first year or two of clinical trials were considered moribund, had not responded to any other treatment, or suffered from an infection which had persisted for many months or years without clinical improvement, gave additional support to the conclusion that penicillin was the instrument whereby

recovery took place. Colebrook and Bodenham treated 150 patients suffering from burns and no staphylococcal or streptococcal infection of a burn failed to disappear under adequate treatment. Florey refers also to the 500 patients treated by Keefer *et alii*, to whom reference has already been made. She then mentions infections of the hand treated by herself and R. Williams. In these cases the results were remarkable—pain was relieved with incision and the first application of penicillin, pus became scanty or disappeared, there was little formation of granulation tissue, movement was restored rapidly and smooth and painless scars resulted, no digit or other tissue was lost when treatment was begun at the first operation. Garrod has also reported that when penicillin was used, war wounds of the soft tissues could be sutured with almost uniform success. In wounds complicated by compound fractures systemic as well as local treatment was applied, but the results were not so striking as with soft tissue wounds. Gas gangrene in seven patients was treated by the systemic route; four recovered. Twenty-three patients with penetrating wounds of the brain were treated; three died. Florey sums up with the statement that investigations to date have shown the value of penicillin: (*a*) as a preventive of infection in wounds, enabling a potentially septic wound to be treated in much the same way as an aseptic one; (*b*) in the promotion of healing in burns and for ensuring the success of skin grafts; (*c*) in infections (due to sensitive organisms) either chronic or of such severity as to render the prospect of death likely, when there has been no response to other forms of treatment; (*d*) in acute infections due to sensitive organisms; (*e*) in the rapid curing of gonorrhœa, including sulphonamide-resistant cases; (*f*) in pneumonia; (*g*) probably in gas gangrene.

The first of the special considerations mentioned is excretion. The rapid excretion of penicillin by the kidneys is both a problem and an asset. As much as 75% of a dose of the drug has been recovered from the urine. It has not yet been established whether the total amount is excreted or whether part is destroyed in the body. The rapid excretion has been of value in determining the time taken for penicillin injected by various routes to reach the circulation and for a single dose to disappear. The drug is also concentrated by the kidneys—after a single dose it can be detected in the urine for well over twenty-four hours, even when the concentration has at no time been great enough to be detected in the blood by present methods. Administration for urinary infection has therefore been successful when repeated only once or twice in twenty-four hours, and staphylococcal and streptococcal urinary infections have been cleared up by doses which were relatively small. The effect on blood cells is of interest. In no case in the Oxford series (blood examinations were generally made) did the number of erythrocytes, as revealed by the count, fall. In the case of all severely ill patients except one there was an average rise of 250,000 to 500,000 cells per cubic millimetre per week. Because of this rise and in view of the poor condition of the myocardium in septic conditions, Florey sees little indication for adding to the work of the heart by giving a blood transfusion. The leucocyte count gives a good indication of the progress of treatment and will probably be used for this purpose. Florey has found that if the count is low from toxæmia (or possibly from previous sulphonamide administration) at the beginning, it begins to rise within twenty-four hours. She also finds that if the count is high in response to the infection it begins to drop steadily as the infection is controlled, but never falls below normal limits. The passage of penicillin between the blood stream and serous cavities is slight, and the reason for this has yet to be found. It means that for certain infections local treatment rather than systemic has to be employed. In regard to radiological findings, when bone is infected a very rapid rarefaction occurs when penicillin is given. The appearances suggest deterioration, whereas the clinical signs indicate that the septic process is under control. Further radiographs indicate the rapid reformation of bony tissue. In regard to bacteriological desiderata it is pointed out that bacteria do not readily disappear from lesions if there is any dead tissue present, nor do they disappear when access by the drug is incomplete. Disappearance and elimination of infection therefore depend on (*a*) a sensitive organism, (*b*) adequate dosage, (*c*) absence of dead tissue, (*d*) full access to the site of infection.

Methods of treatment are discussed by Florey and are also mentioned by Garrod. As already stated, the oral administration of the drug is ineffective; the subcutaneous route has been avoided because of the pain associated with its adoption. Florey thinks that there may be some advantage from its use because an adequate blood level is maintained for longer than when the intravenous and intramuscular routes are used. For systemic administration the two last mentioned are the routes commonly used. Local administration has been used wherever possible, largely because of scarcity of supplies, but also because in many instances it has advantages over systemic administration. Local administration is described by Garrod as economical, but often difficult and sometimes inapplicable; systemic administration is sure in its effect, but immensely costly, using as a rule at least fifty times the amount needed for local treatment. So rapidly is the injected drug excreted by the kidneys that the maintenance of an adequate blood level has been compared by Florey to an effort to keep a bath full with the plug out. An adequate level can be maintained by continuous intravenous infusion by the "drip" method or by intermittent injection. The necessary level may also be maintained by intramuscular injections at intervals of not more than three hours day and night. The standard single dose for an adult is 15,000 Oxford units. This three hourly dosage may have to be continued for seven days or even longer. Since a sudden and dramatic improvement is rarely seen, Garrod will not be contradicted when he states that the price of success is sustained treatment which is arduous for those in charge and disagreeable for the patient. Florey points out that good results have been obtained at the Mayo Clinic and elsewhere with doses much smaller than these mentioned, but she thinks it wise to recommend the larger dosage, which has been found successful in many conditions, especially in view of the fact that organisms may become resistant to penicillin. With local administration, when an infection is localized, and there is a surface or cavity which will retain a suitable vehicle, the action of a single dose may be prolonged for as long as twenty-four hours. Different preparations which have been used for this purpose include: (*a*) a dry calcium-penicillin powder of low potency, (*b*) a powder composed of a calcium-penicillin preparation diluted with sulphanilamide or sulphathiazole powder, (*c*) solutions in distilled water, (*d*) a paste made up of wax, oil and water to which penicillin is added, (*e*) a mixture of penicillin with "Vaseline" or some other base, for use as an eye ointment.

The duration of treatment with penicillin has been found to depend on the time taken to eliminate bacteria from lesions. There is no indication that increased dosage beyond the point necessary to secure complete bacteriostasis is of any value. The effect of higher dosage is merely to cause more rapid excretion of the drug by the kidneys. It will thus be clear that the use of penicillin will call for skill and patience. Garrod states that the duties of the laboratory in connexion with penicillin treatment are very onerous. He insists that without the service of the laboratory, in addition to expert surgical and nursing care, any but the simplest forms of penicillin treatment may easily fail. When penicillin is released by the authorities for use by civilian medical practitioners, the first and most important fact to be remembered will be that the use of the drug should not be considered when there is any possibility that another method of treatment will suffice. Looking beyond this we must realize that more has yet to be learned about penicillin, and it is almost certain that further research will reveal other moulds that will be effective in conditions for which penicillin is of no avail. In the words of Garrod, the discovery of penicillin "is an achievement of the first magnitude, of which the ultimate consequences cannot be foreseen".

Abstracts from Medical Literature.

RADIOLOGY.

The X-Ray Signs of Patent Ductus Arteriosus.

MARK S. DONOVAN, EDWARD B. NEUHAUSER AND MERRILL C. SOSMAN (*American Journal of Roentgenology*, September, 1943) state that a patent *ductus arteriosus* can now be safely ligated or completely divided, which places this congenital lesion among the curable forms of heart disease. The accurate diagnosis of this condition is now vastly more important than formerly, when it was chiefly of academic interest. The radiological signs of patency of the *ductus arteriosus* have a definite value, although they do not prove the diagnosis, nor does their absence exclude it. The X-ray findings in fifty cases of patent *ductus arteriosus* which were verified by operation are presented. These findings in order of frequency are: (*a*) dilatation of the pulmonary artery; (*b*) cardiac enlargement; (*c*) dilatation of the left auricle; (*d*) engorgement of the intrapulmonary vessels; (*e*) exaggerated pulsation of the left ventricle and the pulmonary artery; (*f*) "hilar dance", or pulsation of the vessels in the hila of the lungs. Fluoroscopy and kymograms after closure of the ductus will show a reduction of the ventricular pulsation to the normal amplitude, the pulmonary artery no longer enlarged and pulsating, hilar dance absent, and the left auricle will either be reduced in size or normal.

Peptic Ulceration of the Œsophagus with Partial Thoracic Stomach.

A. S. JOHNSTONE (*British Journal of Radiology*, December, 1943) states that peptic ulceration of the œsophagus and partial thoracic stomach appear to be inseparable. They are found in elderly people, particularly of the sthenic build, in whom the development of hiatus hernia is almost a normal process. The frequent regurgitation of acid, in conjunction with other factors, may give rise to peptic ulceration, which, becoming chronic, produces sufficient cicatrization to shorten the œsophagus and produce a partial thoracic stomach. It cannot, however, be denied that in some cases the latter is congenital. The peptic ulcer starts as an acute ulcer and may either heal or become chronic, the latter change occurring when general devitalization of tissues or persistent irritation is present. There are two types of chronic ulcer, a diffuse superficial inflammation which may show in different parts healing or deep extension, and a deep circumscribed chronic ulcer. It is reasonable to assume that, in the course of time, during which the ulcer recurs or remains chronic, extensive infiltration and fibrosis will occur over a large area, and this extends lengthwise in the tube, so that the œsophagus is likely to become shortened. Here the analogy of the "purse-bag" stomach, due to contraction of the longitudinal fibres, may be mentioned as an illustration of a similar deformity in another part of the alimentary tract. Contraction of the scar tissue causes the lax cardia to be dragged through the hiatus, so that, if a reducible hernia had previously existed, it now becomes irreducible. A vicious circle is established, as the tendency to regurgitation becomes greater. The diagnosis in these cases of hiatus herniæ is essentially radiological. The main distinguishing feature is the change from œsophageal to gastric mucosa, the former being characterized by thin, fine, long longitudinal ridges, and the latter by coarse, granular longitudinal ridges which are met by varicose folds running at right angles from the greater curvature. It may be very difficult to distinguish the change, but the position of a constant spasm which represents the cardia is a help. This again may be confused by a spasm at the epicardia, and not infrequently a bolus of barium is locked just above the hiatal portion, which may resemble a small pouch of stomach. In the cases in which peptic ulcers are found certain characteristic features have been noticed. There is widening of the upper part of the œsophagus to a varying degree with a moderately abrupt tapering to an area of stenosis. Near the upper end of the segment there may be a well-defined deep ulcer, but more often the crater is shallow and impossible to distinguish from an irregularity due to spasm or fibrosis.

Acute Pneumonitis.

WENDELL G. SCOTT AND HORACE L. JONES (*American Journal of Roentgenology*, October, 1943) state that while patients with acute pneumonitis have areas of pulmonary consolidation, physical signs are often absent The clinical picture is not that of pneumonia as it is commonly understood. These patients may even be ambulatory, and have less toxic symptoms than pneumonia patients. The term pneumonia should be restricted, as it is a very serious disease which demands different treatment and generally has a more serious prognosis. There is nothing characteristic about the appearance of the area of pneumonitis that is pathognomonic of the disease. It is usually an area of hazy density extending out from the hilar region into the lower lung field and occasionally into the mid-lung field. In the beginning the margins are poorly defined and gradually fade away into normal lung. The area of infiltration rarely reaches the periphery of the chest. As the disease progresses, the area of pneumonitis becomes denser and larger, with the margins more sharply defined. The shape of the consolidation is usually that of a fan or of a rounded area. The distribution is lobular rather than lobar. With resolution the density gradually diminishes, and the infiltration becomes mottled, patchy and more linear in type. Resolution may be completed in one week to ten days. It is not unusual for the patient's symptoms to disappear before complete resolution has occurred on the radiograph. Likewise the area of pneumonitis, as it appears on the radiograph, seems to be large and out of proportion to the relatively mild symptoms and malaise that afflict the patient. All reports agree that the lower and middle lobes are involved by far the most frequently. Consolidation immediately about the hilum occurs next in frequency, and the upper lobes are involved the least. The etiology remains undetermined, but most investigators strongly suspect a virus, especially when the disease has occurred in epidemics, showing as it does its highest communicability.

The X-Ray Diagnosis of Parasternal Omental Hernia.

LAURENCE L. ROBBINS (*Radiology*, October, 1943) states that parasternal diaphragmatic hernia, which is relatively unusual, generally occurs on the right side. This right-sided location may be attributed to the protection which the left costo-sternal triangle receives from the close attachment of the pericardium and the position of the heart. The contents of the hernia are usually colon or omentum, or both. When a hernia is present, a shadow of soft tissue density is seen on X-ray examination at the right cardiophrenic angle. In the lateral view the shadow lies close to the anterior chest wall. This shadow is rounded or lobulated laterally, superiorly and posteriorly, with an anterior border conforming to the anterior chest wall. The medial border blends with the cardiac shadow and therefore is not visible. The shadow gives the appearance of a mass which, because of its location and density, suggests a mediastinal tumour such as teratoma, lipoma, lymphoblastoma, an aberrant thyreoid gland, or neurofibroma. It is important to differentiate a mediastinal tumour from an omental hernia, not only for diagnostic accuracy, but because of possible surgical procedures. A barium study of the colon will be of significance in herniæ containing omentum as well as those containing large intestine. In the latter type the colon is seen to enter the hernial sac. In the former, the colon appears as an inverted "V", pointing toward the mass in the anterior cardio-phrenic angle, but does not enter the mass. This configuration is a point of diagnostic importance. A gastric examination will show the antrum of the stomach also drawn upward and forward toward the mass, but the examination of the colon gives a more satisfactory and accurate localization. A combination of upward displacement of the large intestine and of the stomach in the presence of a mass in the right anterior cardiophrenic angle gives the radiologist a sign by which he is able to diagnose parasternal omental hernia. If omental hernia is excluded, alternative diagnostic procedures should be instituted.

Two Congenital Deformities of the Tibia.

E. ROHAN WILLIAMS (*British Journal of Radiology*, December, 1943) describes the clinical and radiological appearances of two congenital deformities of the leg. These are congenital angulation (kyphosis) of the tibia and congenital pseudarthrosis of the tibia (and fibula). Both groups have a superficial resemblance in that, typically, there is a forward angulation or bowing in the lower half of the tibia. The frequent association of congenital angulation with other skeletal growth defects makes acceptable the view that the condition is essentially a disturbance of mesenchymal growth due to some inherent defect in the germ plasm. The angulation has been ascribed to a previous fracture during intrauterine life with healing, but there has been

no evidence of past fracture in such bones as have been thoroughly examined. There are two main types of congenital pseudarthrosis. The first type includes pseudarthrosis seen before fracture. Typically the patient is a newborn infant with a slight anterior curvature in the lower half of the tibia; there is no shortening of the *tendo Achillis* and no cutaneous dimpling. If the area of absence of bone is extensive, there may be a certain amount of movement on manipulation. Radiological examination may disclose a single zone of osteoporosis or a multilocular cyst-like area with well-defined margins and moderate cortical expansion. The rarefactive foci may be central or subcortical, and a few trabeculæ may cross the porotic area. The fibula is thickened and curved. The appearances closely resemble an area of local fibrocystic disease; in the latter condition repair is not usually delayed. The second type includes pseudarthrosis seen after fracture. Sometimes union is present, though poor. Following fracture, callus formation is either minimal or not demonstrable; union is very slow, and unless splinting is very strict, the angulation becomes progressively worse. Marked osteoporosis is likely to persist in the distal fragment. The fibula usually undergoes fracture after the tibia. Sometimes frank pseudarthrosis is present. This is the type usually met with clinically, with gross angulation. In the early stage there is marked bone atrophy, especially in the distal fragment. One of the fracture margins, almost always that of the upper fragment (though not invariably), becomes cupped and somewhat splayed. Later this splaying may persist with marginal sclerosis, or disappear, leaving conical fragment margins, the tips of which are sclerosed and may be either sharp or blunted. The treatment of both conditions is difficult and the functional outlook is poor. There is probably little direct ætiological association of the two conditions, though the risk of development of pseudarthrosis in the deliberate corrective treatment of congenital angulation is considerable.

PHYSICAL THERAPY.

The Results of X-Ray Therapy for Metastatic Neoplasms.

W. G. DEUCHER (*American Journal of Roentgenology*, August, 1943) reports on the study of 432 patients with distant metastasis from malignant tumours to compare the fate of the patients who had been given X-ray treatment for their metastasis with the fate of those who had not received any such treatment. All patients with distant metastasis observed at the Radiotherapeutic Institute of the University of Zurich during the ten-year period 1930 to 1940 are considered in this study. As regards the histopathology, the largest group was squamous cell and epidermoid carcinoma of which there were 180 cases. Other groups were: adenocarcinoma, 13 cases; melanoma, 10 cases; seminoma, 7 cases; and carcinoma not specifically listed, 36 cases. There were only 36 cases of sarcoma, as all malignant lesions of the lymphoblastoma type are strictly omitted from the study. The influence on the local metastatic growth, the influence on the survival time and the influence on the duration of the patient's well-being are all considered in the estimation of the palliative effect of radiotherapy in these cases. The best local results were obtained from treatment of metastasis to the bones and skin. The treatment of metastasis to the lungs was carried out in only a small percentage of cases, chiefly in those associated with hilar metastasis, with solitary lung metastasis and with metastatic pleurisy, and gave good local results. The high radiosensitivity of metastasis from seminoma was confirmed by this study. It is shown that local palliation can be brought about in 70% of the patients treated; this corresponds to 45% of the total number. The duration of life is generally longer for the treated patients; only among these do survival periods of more than three years occur. The most important criterion for the usefulness of the treatment is the possibility of restoring and prolonging the patient's well-being. This aim has been reached in about one-half of all cases in which treatment was carried out.

Some of the Effects of Röntgen Irradiation of the Cardio-Vascular System.

J. E. LEACH (*American Journal of Roentgenology*, November, 1943) points out that one should not conclude that circulatory disturbances occurring during or after the time that high voltage X-ray therapy is given for cancer in different regions of the body, are necessarily the result of the radiation. It must be realized that such disturbances may be the result of other factors secondary to the malignant disease itself instead of the therapeutic agent used. Experiments on adult rats were undertaken in order to determine the dose at which myocardial change is evident following high voltage X-ray therapy. In one group, animals were given single doses ranging from 750 to 20,000 *r* through a small precordial portal and killed at weekly intervals. From these experiments it was found that at least 10,000 *r* delivered in a single dose was necessary to produce microscopic evidence of myocardial damage. The changes consisted of degeneration of muscle fibres, intermuscular œdema, capillary hæmorrhages and round cell infiltration. In another group of animals, followed for over a year and given single doses up to 7,500 *r*, no late changes in the myocardium were found. A clinical study was also carried out on patients, who were examined before radiation therapy was given, during the course of treatment and for many months or years afterwards. The examination included the taking of a history, physical examination, an electrocardiographic examination, and a radiological study of the heart and lungs. Altogether 85 patients were investigated, and these fall into three groups, namely: Group I, those who had no radiation delivered to the thorax, Group II, those who had radiation to many regions of the body including the thorax, and Group III, those in whom radiation was directed solely to the thorax. In general there was a fall in blood pressure at the height of the irradiation reaction. This is probably chiefly due to insufficient nourishment with weight loss, anæmia, toxæmia, cachexia and infection. A carotid sinus syndrome sometimes developed when infected cervical glands containing metastatic cancer were treated. The venous pressure may be elevated and the circulation times may be prolonged. In general two types of alteration were observed in the electrocardiograms. The first occurred in all groups, and were essentially minor changes in the voltages of the different waves in serial tracings, and were probably due to the changing physiological state of the myocardium caused by anæmia, toxæmia, cachexia and possibly a depressive effect of the radiation itself. No changes in the conduction mechanism were found. However, a more bizarre type of change was seen in patients who were treated for cancer of the breast. There were frequent changes in the voltages of the *QRS* complex. It is emphasized that these electrocardiographic alterations must be taken as due to changes in the direction of the electrical pathways and not as the result of any myocardial change. In fact similar changes may occur in patients who have had a radical mastectomy without any radiation therapy. Moreover, none of these patients developed heart disease—their symptoms and signs are all due to pulmonary fibrosis. The author concludes that there is no evidence that the heart itself has been damaged by X-ray therapy as it is used today in the treatment of cancer.

OBSTETRICS.

Preeclampsia.

W. S. MORSE (*The Western Journal of Surgery, Obstetrics and Gynecology*, November, 1943) reviews the new advances in the ætiology and treatment of preeclampsia. A sudden gain in weight late in pregnancy followed by œdema, hypertension and albuminuria helps to distinguish preeclampsia from preexisting nephritis or essential hypertension. Preeclampsia is thought to be associated with functional rather than structural kidney change, and the latest tendency is to regard it as due to a generalized spasm of arterioles rather than as a primary disease of the kidneys or liver. Many of the features of preeclampsia are found to depend on an increase in the extracellular water of the body, and, since this is aggravated by retention of the sodium ion, salt should be eliminated from the diet. Contrary to the orthodox opinion, a diet with a high protein content is recommended on the grounds that œdema is increased by a low level of plasma protein. Another suggestion is that there should be a high fluid intake in preeclamptics rather than the usual restricted intake. The reason for this is that an impaired kidney can excrete only the normal amount of solids and electrolytes, if it can form a large volume of urine. Hypertonic dextrose solutions are recommended to reduce the intracranial pressure and magnesium sulphate for its anticonvulsant and vasodilator effects. Although good results follow these lines of treatment, the ætiology still remains an unsolved problem. The role of hormones is undergoing investigation, but no reliable conclusions have yet been reached.

British Medical Association News.

SCIENTIFIC.

A COMBINED meeting of the Queensland Branch of the British Medical Association with the Brisbane Hospital Clinical Society was held on February 4, 1944, at the Brisbane Hospital, DR. O. HIRSCHFELD, Chairman of the Brisbane Hospital Clinical Society, in the chair.

An Unusual Skin Condition.

DR. S. F. MCDONALD showed a boy, aged five and a half years, who came from the country. The child had always been well until two months earlier, and then he began to lose weight. On examination no abnormality could be found beyond slight anæmia and a thin raised white line on the inside of the left leg, which began near the ankle and went up to the groin. It did not follow the course of the saphenous vein. The doctor who referred the patient thought the lesion might be due to guinea worm. Dr. McDonald asked for an expression of opinion regarding the diagnosis. All investigations had given negative results. No treatment whatever had been given since the child was admitted to hospital. A biopsy was being considered.

None of the members present was able to offer any suggestions as to the nature of the white streak.

Chronic Lung Disease

DR. A. E. PATERSON showed a girl, aged three and a half years, whom he had first examined at the out-patient department ten months previously. She had then suffered from cough for some time. The percussion note was flat at the base of the left lung, and the breath sounds were diminished. Coarse râles were heard in the right lung. An X-ray examination revealed a small patch of unresolved pneumonia at the base of the left lung. Three months later she contracted scarlet fever. While she was in hospital the whole of the left side of the chest became dull on percussion; breath sounds were absent from the base of the left lung, but tubular breathing and crepitations were heard at the left lung apex.

After four weeks she was transferred to the Children's Hospital with the provisional diagnosis of empyema. When the child was examined, coarse râles were heard in the right lung. Grossly deficient air entry and a flat percussion note were noted in the left lung. The X-ray picture gave the impression that empyema was a possibility; but Dr. Paterson said he doubted this diagnosis, and the child was left alone. Aspiration of her chest was attempted three times, but no fluid was found. She had no elevation of temperature, and as her general condition was good, she was allowed to get up and walk about. She was discharged from hospital recently in the same state as before—in other words, her general health was good and her weight normal; but she had a persistent cough, the percussion note was flat all over the left side of the chest, tubular breathing was present at the apex of the left lung and breath sounds were absent at its base, and scattered râles were heard in the right lung. In December Dr. Clowes had performed a bronchoscopic examination under paraldehyde anæsthesia and aspirated some mucopus from the left bronchus. The base of the left lung immediately became partially aerated, but next morning it was the same as before. Dr. Paterson showed a series of X-ray plates from this child, which revealed complete opacity of the left lung field, the trachea being drawn over to the affected side. He could not understand why she was so well.

DR. N. SUTTON asked whether a sputum test had been made.

Dr. Paterson replied that all tests gave negative results and there was no sputum.

DR. A. MURPHY suggested that the condition might be massive atelectasis, possibly caused by epituberculosis, despite the negative responses to the Mantoux test.

DR. S. F. MCDONALD suggested that the child was suffering from an extensive fibrosing condition of the lung, which had probably started in the pleura and then invaded the lung. He had seen such a condition before.

An American medical officer who was present suggested lipoid pneumonia.

Dr. Paterson replied that the mother of the child had said that no oily drops had been administered.

DR. L. B. ELWELL asked whether postural drainage of the lower lobe of the left lung had been carried out continuously for any length of time, and suggested that it should be tried for long periods every day.

Pyopneumothorax.

DR. F. ARDEN showed a boy, aged eighteen months, who had been admitted to hospital suffering from measles, which was folowed by bronchopneumonia. Two weeks later scarlet fever developed. This caused a recurrence of bronchopneumonia, the left lung being chiefly affected. A few days later he suddenly became acutely distressed and was found to have a left-sided pneumothorax with extreme displacement of the mediastinum to the right. Aspiration was performed and a quantity of air and two ounces of watery pus were removed from the left pleural cavity, with temporary relief of symptoms. Hæmolytic streptococci were grown in pure culture from the pus. Aspiration was repeated almost daily for three weeks, a mixture of pus and air being removed on each occasion. X-ray pictures taken during this period revealed hydropneumothorax, and an abscess cavity in the partially deflated left lung. The child was desperately ill for three weeks; for many days he was given saline solution intravenously because of persistent vomiting. Three blood transfusions and various sulphonamide drugs were given.

After three weeks the pus was considered thick enough to drain. Under local anæsthesia two tubes were inserted through an intercostal space without rib resection, and closed drainage with continuous suction was instituted. The child made a good recovery. At the time of the meeting he was well, except for a "loose" cough. An X-ray film taken the previous day showed the left lung to be fully expanded. The wall of the lung abscess was still visible.

Staphylococcus Aureus Septicæmia.

DR. M. GEANEY presented the temperature chart of a woman, aged forty-two years, who suffered from *Staphylococcus aureus* septicæmia after he had performed a gastro-enterostomy operation and inserted a cannula for the intravenous drip administration of saline solution. After two days the cannula became blocked, and the next day the patient had a rigor; cultural examination revealed *Staphylococcus aureus* in the blood stream. Sulphathiazole was given for a few days, but the patient eventually refused to take any more, and on the eighth day she was given 300 cubic centimetres of crude penicillin intravenously. There was no severe reaction, and the temperature fell. The administration of penicillin was repeated on the tenth and twelfth days. On each occasion her temperature fell, to rise again after twenty-four hours. On the fifteenth day a staphylococcal abscess developed on the vein originally used for the first intravenous drip administration of saline solution. This was opened, and a further 300 cubic centimetres of penicillin were administered. A blood count gave the following information: the hæmoglobin value was 65%, the erythrocytes numbered 3,200,000 per cubic millimetre, and the leucocytes numbered 13,000 per cubic millimetre. On the twenty-third day her blood still contained *Staphylococcus aureus*. Another 300 cubic centimetres of penicillin were given. On the twenty-seventh day her temperature was again elevated, and she was given more penicillin, and the following day she was given a double amount of penicillin (600 cubic centimetres), after which her temperature stayed down. She felt cold on each occasion, but had no rigor. Five days later she developed small bowel obstruction from adhesions from an old pelvic operation. At the operation Dr. Geaney found a small abscess in the mesentery, but not at the site of the obstruction; this was thought to be a metastatic abscess. Next day the patient was in a state of moderate collapse, and a litre of plasma and one of whole blood were given. At the time of the meeting she was fully recovered and had been discharged from hospital. Dr. Geaney believed that the penicillin had cured her, as on each occasion her temperature had fallen following its administration.

DR. S. F. MCDONALD said that this patient was the first in Brisbane to be given the crude penicillin made locally by Professor Duhig. Dr. McDonald had tried it only once, but his patient had had a severe reaction.

DR. F. ARDEN quoted some other cases in which this penicillin had been administered. He had noticed severe reactions also, but he thought the treatment was well worth trying in desperate cases.

DR. O. HIRSCHFELD said that penicillin itself was non-toxic, but some allied moulds were exceedingly toxic.

Elephantiasis.

Dr. Geaney then showed a man with extreme elephantiasis of the right leg, from which he had suffered for the past seventeen years. An operation had been performed fifteen years ago without relief. His limb was painful and heavy. Dr. Geaney asked for suggestions as

to how to relieve this man, who had lived in Brisbane most of his life, and had never been north of Maryborough.

DR. B. A. SINCLAIR pointed out that the foot was not affected.

DR. L. A. WINDSOR-McLEAN said that Dr. E. H. Derrick had recently found *Filaria bancrofti* in a lymph gland removed from a patient near Brisbane and had discovered microfilariæ in 17 out of 252 men selected at random at a mental hospital.

DR. N. W. MARKWELL said that in some investigations carried out in Brisbane thirty-five years earlier, 17% of 20,000 patients admitted to the Brisbane Hospital had been found to have filariæ in their blood.

DR. N. SUTTON suggested amputation, which would at least relieve the patient of the weight. Excessive bleeding would be encountered.

DR. C. C. MINTY drew attention to the fact that the limb should be bandaged firmly for some time before the operation, and that the patient should be kept recumbent for six weeks.

Treatment of Devitalized Bowel in Strangulated Hernia.

DR. A. D. D. PYE reviewed two cases in which it had been necessary to resect bowel. One of the patients was a male, aged thirty-two years, and the other a female, aged forty-four years; the former suffered from a right inguinal hernia, the latter from a right femoral hernia. In both cases the hernial sac contained a loop of the distal portion of the ileum, which had perforated. The bowel was resected and an ileostomy was performed, with subsequent restoration of the continuity of the alimentary tract. Although in both cases the sac of the hernia only was removed, and no attempt was made at repair, there had been no recurrence. The male patient had been doing heavy work.

Dr. Pye said that if resection and an immediate anastomosis were performed, the patients almost invariably died. Although these patients were younger than those in whom the condition was usually found, they had both made a satisfactory recovery.

Post-Traumatic Epilepsy.

DR. N. V. YOUNGMAN showed two patients suffering from epilepsy associated with head injuries. The first was a man, aged twenty-two years, who had been backward in walking and talking, and was retarded in his school work. At the age of twelve and a half years he fell from a motor-lorry and was unconscious for half an hour. He then began to suffer from frequent "giddy turns"; three months later these changed into typical major seizures preceded by a visual aura. At the age of fifteen years he had a number of these seizures and was taken to hospital. After this attack his left side became paralysed. Since then he had had attacks frequently, but they were less severe, and were now preceded by an aura in which for twenty-four hours beforehand he became excep,tionally hungry. Examination revealed an old hemiplegia, especially of the face and arm, reduced discriminative sensation and a homonymous hemianopia. Dr. Youngman had performed an encephalographic examination on this patient, and he considered the right ventricle to be smaller than normal, to be displaced downwards and facewards, and to have an indentation on its upper surface. Dr. Youngman emphasized that this man did not have the so-called "idiopathic" epilepsy, but that he had either (i) a subdural hæmatoma or (ii) a congenital cerebral defect which his accident had accentuated.

DR. N. SUTTON thought that the smaller (right) ventricle shown in the encephalogram was the normal one, and that the larger (left) ventricle was pathologically dilated.

Dr. Youngman's second patient was a man, aged thirty years; seven years previously he had been run over by a tram car and suffered a compound fracture of the skull. He was unconscious for a week. For five years he had had severe throbbing frontal headache and incapacity for work. Then he had three seizures without any warning. X-ray examination revealed a large bony defect in the frontal region. Dr. Youngman considered that the headaches were more likely to be a form of epilepsy than part of the so-called "post-concussive syndrome". The patient had responded well to treatment with "Dilantin" and phenobarbital. It was ascertained that this man's brother had suffered from epilepsy for thirty-eight years, and was now responding to identical treatment.

Hyperostosis Frontalis Interna.

DR. A. MURPHY described the case of a married woman, aged forty-nine years, who had been referred to him in December, 1943. She had had three children and her health had always been good; menstruation was still regular, but with increasing loss. Her family physician, however, stated that she had become emotional and had commenced to imagine herself the subject of various diseases. On October 5, 1943, while she was sweeping the stairs, her left hand suddenly "froze" onto the broom; with her right hand she endeavoured to loosen the grip of the left, but while so doing felt her "whole body beginning to move" and lost consciousness. She recovered twenty minutes later and found that she had bitten her tongue severely. A week later a similar attack occurred, but without loss of consciousness. Thereafter she experienced convulsive seizures affecting the left arm; these increased in frequency, and at the time of consultation she was having four or five a day. Immediately after each attack the left side of her face felt flushed and frequency of micturition was noticed. The patient stated that she had found that if she pressed between the bones of the forearm just above the wrist the duration of the seizures was appreciably lessened.

The only abnormalities found were increased activity of all tendon reflexes, with exaggeration of those of the left arm, together with pronounced weakness of the limb. There were no changes in the retinæ and no disturbances of sensation. A clinical diagnosis of intracranial tumour involving the right motor cortex was made and further investigations were carried out. Lumbar puncture yielded clear fluid under a pressure of 150 millimetres, containing one cell per cubic millimetre; the total protein content was 20 milligrammes *per centum*; the Wassermann and colloidal gold tests gave negative results.

Dr. Murphy then showed X-ray films of the skull which had been reported on as showing irregular thickening of the inner table of the frontal bone, probably an osteoma. However, in his opinion the appearance was characteristic of the condition of *hyperostosis frontalis interna*.

Dr. Murphy said that this condition had first been well described by Morel in 1930. It was not particularly rare, being perhaps the commonest cause of female dementia. X-ray films of 200 consecutive female patients admitted to a mental hospital in the United States of America had shown an incidence of 25%. It was a disease of females, and appeared as a rule in the fifth decade. In the patient in question, although lesions in the skull over the motor area could not be visualized, the symptoms and signs strongly indicated their presence in this locality. Therefore, as she was becoming physically crippled, and as the mental deterioration was usually gradual, extending over a period of years, Dr. Murphy had persuaded Dr. Neville Sutton to operate, with a view to removing any lesions causing pressure on the motor cortex.

DR. N. SUTTON said that at Dr. Murphy's request he had operated on this patient, rather reluctantly. Osteophytic growths were found on the inner table; these were fairly soft and came away easily with a curette, a shallow pit being left. The dura was not adherent to the bony tumour, but it was adherent to the underlying brain. This patch of dura was excised. The operation, performed two weeks prior to the meeting, had relieved the constant spasm in the patient's left arm. She had some paresis of the left arm and the left side of her face. She was euphoric, however, and Dr. Sutton considered that the ultimate prognosis was poor.

Electrocardiograms.

DR. L. D. WALTERS showed some electrocardiographic tracings from two patients suffering from coronary occlusion and from a patient suffering from rheumatic fever.

Medical Societies.

THE QUEENSLAND MEDICAL WAR BENEFIT FUND.
1943.

THE following annual report of the Queensland Medical War Benefit Fund, 1943, is published at the request of the trustees of the fund.

The trustees have pleasure in reporting as follows on the operation of the scheme from the date of its inception, namely, May 1, 1943. The first year of the scheme will thus end on April 30 next.

1. The Trust Deed herein provides that: "The scheme shall continue for at least one year from the date of its coming into operation and shall continue for such further

period or periods of one year each as shall be agreed to by each contributor, such agreement being evidenced by the contributor's signature to a consent to such continuation for the year . . . provided that the scheme shall not be continued for any year unless fifty contributors have so consented."

2. The number of members at the present time is 61, and in addition we have received donations from 25 doctors.

3. The total amount of contributions and donations received to date is £2,597 0s. 4d., and at the moment there is the sum of £17 14s. 4d. outstanding. This will prove sufficient to pay the benefits and expenses until the end of April without making any assessment for that month.

The maximum amount paid by any member during the period of the scheme has been £45 12s. The minimum amount for the full twelve months was £1 18s.

The total amount of donations received from non-members to date is £490 13s. 10d. The largest donation was £60.

4. The benefits paid to 13 members (including those for the month of April) total £2,425, while the full expenses of management will amount to approximately £100.

5. It now remains to be determined by the members of the British Medical Association whether this scheme, with or without amendments, should be continued for a further period of twelve months.

The trustees have held eleven meetings during the period of the scheme.

(Signed) J. G. WAGNER.
J. G. AVERY.
J. V. DUHIG.
M. GEANEY.

THE MEDICAL WOMEN'S SOCIETY OF NEW SOUTH WALES.

The following annual report of the Medical Women's Society of New South Wales for the year ended March, 1944, is published at the request of Dr. Mary C. Puckey, the Honorary Secretary of the society.

During the year two general meetings were held, both at the Rachel Forster Hospital. At the June meeting an address was given by Dr. E. P. Dark, of Katoomba, on "Some Social Aspects of Medicine". The October meeting took the form of a clinical meeting at the Rachel Forster Hospital. The January meeting, which was to be a social afternoon to sixth year women medical students, had to be postponed until April 1, 1944, as it was inconvenient for the students to attend prior to their examinations. A special social afternoon was held at the Rachel Forster Hospital on Tuesday, November 23, when members entertained Dr. Edith Paterson.

Five committee meetings were held during the year.

National Emergency Measures.

MEDICAL EQUIPMENT AND SUPPLIES.

THE two following notices are published at the request of the Medical Equipment Control Committee.

Rubber Hot Water Bags.

The recent arrival of 25,000 imported rubber hot water bags can afford only partial relief to the supply position.

The Medical Equipment Control Committee desires that medical practitioners should know that distributors have been informed by the Controller of Rubber, Directorate of Supply, that supplies shall be made only upon the receipt of a declaration signed by a registered medical practitioner or by the matron of a hospital that these are urgently needed for medical purposes. The requirements of public and private hospitals will of necessity take precedence over other applications. The allocations to the States are on a *pro rata* population basis. It should be remembered that substitutes are available, and in view of the rubber shortage there should be cogent reasons why a rubber hot water bag is prescribed. In making a declaration the nature and urgency of the need should be clearly specified. The release to retailers is expected to take place at an early date.

Improvement in Stocks of Bismuth.

In the notes on wartime prescribing in the introduction to the Australian War Pharmacopœia, it is stated that:

"Bismuth and its Salts should be used only for the treatment of syphilis and tropical diseases.

"For oral administration they may be efficiently replaced by Colloidal Kaolin, Magnesium Trisilicate or various combinations of these with alkalis. However, because of the temporary uncertainty of stocks of suitable Kaolin and Magnesium Trisilicate, formulæ for Bismuth mixtures have been retained."

The Medical Equipment Control Committee announces that because of an improvement in the position of stocks of bismuth this instruction no longer applies to medical prescriptions.

NATIONAL SECURITY (MEDICAL CO-ORDINATION AND EQUIPMENT) REGULATIONS.

Control of Penicillin Order.

THE following Control of Penicillin Order has been promulgated in the *Commonwealth of Australia Gazette*, Number 85, of May 3, 1944.

In pursuance of regulation 42 of the National Security (Medical Co-ordination and Equipment) Regulations, and of the powers delegated to me by the Chairman of the Central Medical Co-ordination Committee by instrument of delegation dated the fourth day of October, 1943, issued under regulation 20 of these Regulations, I, Hibbert Alan Stephen Newton, acting upon the recommendation of the Medical Equipment Control Committee, hereby make the following Order:

Citation.

1. This Order may be cited as the Control of Penicillin Order.

Supply of Penicillin.

2.—(1.) Subject to paragraphs 4 and 5 of this Order, a person shall not supply Penicillin to any other person for the treatment of any member of the civil population, except upon production of a written certificate in the form set out in the Schedule to this Order addressed to the Senior Commonwealth Medical Officer in the State or Territory concerned, signed by two legally qualified medical practitioners, and containing a statement that the patient is suffering from one or other of the following diseases:

Septicæmia or pyæmia (excluding infective endocarditis),
Meningitis,
Cerebral abscess,
Primary blood borne osteomyelitis,
Pneumonia,
Cavernous sinus thrombosis,
Gas gangrene,
Tetanus,

and that the disease has been verified by bacteriological examination.

(2.) Where the patient is suffering from pneumonia or meningitis the medical practitioners prescribing Penicillin shall certify that sulphonamide therapy has failed.

Use of Penicillin.

3. Penicillin shall not be used by any person for the treatment of any member of the civil population except for the treatment of a disease caused by one or more of the following organisms:

Neisseria gonorrhœæ,
Neisseria meningitidis,
Staphylococcus aureus,
Streptococcus pyogenes,
Bacillus anthracis,
Actinomycosis bovis (hominis),
Clostridium tetani,
Clostridium welchii,
Clostridium septique,
Clostridium œdematiens,
Corynebacterium diphtheriæ,
Streptococcus viridans,
Pneumococcus,
Anaerobic streptococcus, or
Treponema pallidum.

Power of Senior Commonwealth Medical Officer or his Deputy to Waive Certain Requirements.

4. The Senior Commonwealth Medical Officer in any State or Territory or his deputy may, in any particular case in which, in his opinion, it is desirable to take such action, waive any of the requirements set out in paragraph 2 of this Order, except that relating to the production of a written certificate signed by two legally qualified medical practitioners.

Power of Director-General of Health to Make Penicillin Available for Experimental Purposes.

5. Nothing in this Order shall prevent the Director-General of Health of the Commonwealth making Penicillin available for experimental purposes.

THE SCHEDULE.

Form of Certificate for Supply of Penicillin.

To the Senior Commonwealth Medical Officer, State of .....

We, the undersigned medical practitioners, hereby certify that the particulars set out hereunder in regard to the patient named herein are, to the best of our knowledge and belief, true and correct.

Name of patient:
Age:
Address:
Disease from which patient is suffering:
Quantity of Penicillin to be supplied:
Where treated (at home, hospital, etc.):
Date of injury or onset of illness:
Clinical history (essential details only of previous treatment, operative and therapeutic):
Results of bacteriological investigation and other laboratory findings:
Essential details of treatment and current clinical history:
Result:

(Signatures)

Names and addresses [*in block letters*].

Dated this twenty-eighth day of April, 1944.

ALAN NEWTON,
Chairman, Medical Equipment Control Committee, acting as delegate of the Chairman, Central Medical Co-ordination Committee.

Post-Graduate Work.

MEDICAL JOURNALS AND TEXT-BOOKS FOR MEDICAL OFFICERS IN FORWARD AREAS.

THE New South Wales Post-Graduate Committee in Medicine has been requested to assist in providing medical journals and text-books for medical officers serving in forward areas who have no access to such facilities which may be available to hospital units. The committee would be pleased to receive from any medical men and others any discarded current medical journals or text-books which could be forwarded in this way.

Journals and text-books may be left at the office of the Post-Graduate Committee, 145, Macquarie Street, Sydney, where they will be collected by Colonel A. M. McIntosh, D.D.M.S., N.S.W. L. of C. Area, and sent to Brigadier Furnell in New Guinea, who will supervise their ultimate distribution.

Correspondence.

THE WASSERMANN REACTION TEST AND FALSE POSITIVES.

SIR: One is occasionally asked by the general practitioner what he is to do with a serological report, giving the Wassermann reaction test, and the Kahn precipitation test, when these two do not agree.

I have always expressed the opinion that the result of the Wassermann test should be given precedence. But, after all, one's own opinion can not be expected to be taken as final by everybody.

And so, in order to give strength to my opinion, I take the liberty of quoting Dr. Orpwood Price, of the London County Council (Whitechapel) Clinic. He states: "With regard to dropping the Wassermann test in favour of precipitation tests, I personally do not agree. During the last twelve years I have performed an average of 7,000 Kahn tests a year, before which I had some training with Kahn himself when he was at St. Thomas' Hospital. In my hands the test is not so reliable as the Wassermann. I get too many false positives, particularly in well-treated cases."

Yours, etc.,
A. E. FINCKH.

227, Macquarie Street,
Sydney,
April 19, 1944.

AN UNUSUAL ERUPTION AMONG SERVICE PERSONNEL.

SIR: Over some years now, I have had the honourable, though arduous, job of looking after the skins of Royal Australian Air Force and Royal Australian Navy personnel in New South Wales. In addition, those army personnel discharged as medically unfit due to skin trouble have been, from time to time, under my care at the Prince of Wales Repatriation Hospital.

I have been struck with certain aspects of skin lesions not seen in civilian practice. In many patients ordinary eczematous rashes have taken on a deep pigmentation and a thickened and heaped-up horny layer—being raised two millimetres above the ordinary skin surface—resembling some aberrant forms of *lichen planus*.

About twelve months ago I suggested that some research should be done (*a*) to find out if the taking of any particular drug had any effect, (*b*) if the sulphonamides were to blame, (*c*) if some chemical reaction of the two substances could be held responsible. Investigations are being made on these lines.

Yours, etc.,
J. WITTON FLYNN, M.B., Ch.M.,
Wing Commander, Royal Australian Air Force.

Macquarie Chambers,
183, Macquarie Street,
Sydney.
April 22, 1944.

PROLONGED RETENTION OF A FOREIGN BODY IN THE AIR PASSAGES.

SIR: My father, Dr. J. M. Pardey, who practised in Launceston, Tasmania, for fifty-two years, and who retired about twelve years ago, being now aged eighty-two years, recently received a letter from Dr. D. E. Currie, of Christchurch, New Zealand. Father sent the letter on to me with the comment that there was no X-ray in those days, and as the patient had no symptoms, there was no reason to suspect the presence of a foreign body in the lung.

I feel that the letter is of sufficient interest to warrant its publication. Dr. Currie writes:

> I have before me a piece of a clinical thermometer. It is 1·5 cm. long and jagged at both ends. Its history will, I think, interest you. In 1892 you took the temperature of a lad named T. H. Ruston, æt. 19. He bit the thermometer and inhaled this piece, and 50 years later, viz., in 1942, when he was 69 and living here in Christchurch, he was stooping down in the garden, gave a cough, and coughed it up. I should think this a record.

Yours, etc.,
GEOFFREY J. PARDEY.

Stuart Street,
Wahroonga,
New South Wales.
May 4, 1944.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 86, of May 4, 1944.

ROYAL AUSTRALIAN AIR FORCE.

Citizen Air Force: Medical Branch.

Flight Lieutenant M. Rohan (253344) is granted the acting rank of Squadron Leader whilst occupying a Squadron Leader post with effect from 11th March, 1944.

The appointment of Flight Lieutenant A. A. Crook (253894) is terminated at his own request with effect from 4th March, 1944.

The appointment of Flight Lieutenant W. J. Griffiths (287276) is terminated with effect from 20th March, 1944.

Reserve: Medical Branch.

The following officers are transferred from the Active List with effect from the dates indicated: (Squadron Leaders) N. L. Newman (262890) (8th March, 1944), G. Matthews (263561) (20th March, 1944), (Flight Lieutenants) J. Barnes (264590) (8th March, 1944), W. L. Fowles (261510) (11th March, 1944).—(Ex. Min. No. 123—Approved 2nd May, 1944.)

DECORATIONS.

THE Department of the Army has announced that His Majesty the King has been pleased to approve of the following awards for gallant and distinguished services in the South-West Pacific Area to members of the Australian Army Medical Corps of the Australian Military Forces.

To be a Commander of the Military Division of the Most Excellent Order of the British Empire: Brigadier William Allen Hailes, D.S.O.

To be Officers of the Military Division of the Most Excellent Order of the British Empire: Major (Temporary Lieutenant-Colonel) William Dudley Refshauge; Major (Temporary Lieutenant-Colonel) Richard Stanley Smibert; Major Stuart Lindsay Mainland.

Mentions in Dispatches: Colonel (Temporary Brigadier) Herbert Gibling Furnell, C.B.E., D.S.O.; Lieutenant-Colonel (Temporary Colonel) Stanley Haines Lovell; Lieutenant-Colonel (Temporary Colonel) George Brumfitt Gibb Maitland, D.S.O., D.C.M.; Lieutenant-Colonel Stanley Devenish Meares; Lieutenant-Colonel Roderick Hector MacDonald; Major (Temporary Lieutenant-Colonel) Joseph McDouall Mack; Major (Temporary Lieutenant-Colonel) Edward Charles Palmer; Major Clive Herbert Selby; Major Colin Campbell Wark; Captain (Temporary Major) Thomas Moore Clouston; Captain (Temporary Major) Donald Campbell Dawkins; Captain (Temporary Major) Kiernan John Joseph Dorney; Captain (Temporary Major) Malcolm Livingston Edwards; Captain (Temporary Major) Edward Peter Row; Captain (Temporary Major) James McRae Yeates; Captain Nugent Elliott Brand; Captain Hugh Busby; Captain David Robertson Reid; Captain L. Sender.

CASUALTIES.

ACCORDING to the casualty list received on May 3, 1944, Captain N. C. Derkenne, A.A.M.C., Hamilton, has been removed from the "seriously ill" list.

According to the casualty list received on May 3, 1944, Captain A. R. Edwards, A.A.M.C., Waverley, has been placed on and removed from the "seriously ill" list.

According to the casualty list received on May 4, 1944, Captain M. A. Gardner, A.A.M.C., Ryde, has been transferred from the "dangerously ill" list to the "seriously ill" list.

According to the casualty list received on May 6, 1944, Major D. M. Brown, A.A.M.C., Echuca, Victoria, has been placed on the "seriously ill" list.

Obituary.

EDMUND FRANK LIND.

WE regret to announce the death of Brigadier Edmund Frank Lind, which occurred on May 2, 1944, at South Yarra, Victoria.

GEORGE HENRY STANDISH LIGHTOLLER.

WE regret to announce the death of Dr. George Henry Standish Lightoller, which occurred on May 4, 1944, at Sydney.

GORDON O'NEILL.

WE regret to announce the death of Dr. Gordon O'Neill, which occurred on May 6, 1944, at Launceston, Tasmania.

Diary for the Month.

MAY 15.—Victorian Branch, B.M.A.: Hospital Subcommittee.
MAY 15.—Victorian Branch, B.M.A.: Finance Subcommittee.
MAY 16.—New South Wales Branch, B.M.A.: Medical Politics Committee.
MAY 16.—Victorian Branch, B.M.A.: Organization Subcommittee.
MAY 17.—Western Australian Branch, B.M.A.: Branch Meeting.
MAY 18.—New South Wales Branch, B.M.A.: Clinical Meeting.
MAY 18.—Victorian Branch, B.M.A.: Executive Meeting.
MAY 23.—New South Wales Branch, B.M.A.: Ethics Committee.
MAY 24.—Victorian Branch, B.M.A.: Council Meeting.
MAY 25.—New South Wales Branch, B.M.A.: Branch Meeting.
MAY 26.—Queensland Branch, B.M.A.: Council Meeting.
MAY 30.—Federal Council, B.M.A.: Meeting in Sydney.
JUNE 1.—New South Wales Branch, B.M.A.: Special Groups Committee.
JUNE 2.—Queensland Branch, B.M.A.: Branch Meeting (Joseph Bancroft Memorial Lecture).
JUNE 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.
JUNE 7.—Victorian Branch, B.M.A.: Branch Meeting.
JUNE 7.—Western Australian Branch, B.M.A.: Council Meeting.
JUNE 9.—Queensland Branch, B.M.A.: Council Meeting.
JUNE 9.—Victorian Branch, B.M.A.: Legislative Subcommittee. Finance Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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